In This Issue: Summer Uses of Electricity in the West

JOURNAL OF ELECTRICITY

VOL. 41 NO. 3 SAN FRANCISCO, AUGUST 1, 1918 PER COPY, 25 CENTS

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

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A UNIQUE SUMMER USE OF ELECTRICITY IN THE WEST

The great mountain ridges of the West, granite peaks and forested valleys down which innumerable mountain streams plunge their way, not only form a wonder playground for vacationists, but provide the water power close at hand to provide conveniences for these summer needs. Throughout the mountain regions of the Pacific, hotels, summer cottages and camps are dotted in close proximity to undeveloped power sources. In some few places, such as the beautiful Yosemite Valley of California, a small percentage of this power has been harnessed, with the result that a very real field for hotel appliances and apparatus has developed. The complete electrical installation at Camp Curry, Yosemite, is described on a later page of this issue.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 41 SAN FRANCISCO, AUGUST 1, 1918 Number 3

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We Who Cannot Go

We who should like to be in France—we of the weak heart and the family ties and the heavy years, this is our pledge:

"That we shall do each day more faithfully our unglorified task; that we shall make our daily sacrifice unseen to give where it is needed, saving only what we need to live; that we fulfill our duties as a citizen, helping to keep our country worth the fighting for. And in a maze of false reports and neighbors' questionings, we shall have quiet confidence in our democracy—believing not only in the strength of our arms and the righteousness of our cause, but in the high intent and essential honesty of those who serve in public places—with faith in the ability of a people to govern themselves."

So when the boys return, though we may count our service nothing in comparison with theirs, yet we shall have no need to hide our head ashamed.

Truth in Advertising

Calling advertising men "truth-tellers" In days not too far past would have implied a sarcastic inflection. And yet that was the name generally applied to the delegates of the recent advertising convention held in San Francisco and indeed fairly marks the spirit of the gathering. It is broadly recognized in legitimate fields that it does not pay to claim more for your product than the article will justify. The world is, however, not yet perfect and there still remains even in the advertising of worthy goods, a tendency toward pseudo scientific methods which savor a little too strongly of the patent medicine. Not long ago there appeared, for instance, an advertisement of Pork and Beans accompanied by the picture of a scientist and the claim that these beans were scientifically baked not by cooks, but by scientists in testing laboratories. Now the beans were good—and would not have suffered from a more truthful advertising. A practice not to be recommended but too ready is that of writing to the demestic science or other departments of universities asking advice or opinion on general subjects and then quoting a portion of the reply with inserted reference to the product advertised. The—apparently—scientific lecturers who talk at country fairs and even at extension demonstrations throughout agricultural districts, discoursing with ostensible fairness on the values of soap or shortenings and at the same time insinuating their product into attention are wholly reprehensible. No one questions the right or value of a demonstration, nor the giving of scientific information in connection with it—when the advertising is frankly labeled. But to mix science and advertising and call it all science is a practice very like that of the patent medicine quack who quotes a doctor book for symptoms and then in the same tone of voice recommends his product as a cure-all.

The electrical field is singularly free from this reprehensible type of advertising, but the temptation to exaggeration and to advertising tricks is always there. The worst of it is, that it often succeeds for the moment—but in the end, any business from a factory to a contractor-dealer's store, succeeds on the basis of the character of the man who runs it. And honesty in spirit as well as in name is the surest foundation.

The Growth of Electrical Refrigeration

One of the most remarkable new applications of electrical energy is that of refrigeration and cold storage. Scarcely two years have passed since this important electrical load became recognized as a commercial possibility. This growth is well emphasized in developments in Southern California. Converts to the method electrical were slow at first, but the increase now seems to be in the geometric ratio. In fact, since September, 1917, the commercial department of the Southern California Edison Company reports that several plants have been induced to electrify, amounting in all to about 4000 horsepower, one alone being over 2000 horsepower. This class of energy at better than an annual load factor of 80 per cent and a power factor close to unity, on account of synchronous motors, is most ideal.

The use of refrigeration as a whole is on the increase. The building of a series of cold storage plants at shipping ports is part of the present national Food Conservation plan and a campaign is

being conducted in this connection to break down public prejudice. On the other hand, the domestic possibilities in electrical refrigeration have not begun to be realized—and the development of an inexpensive household equipment is one of the most fascinating problems remaining to the experimenter. The United States probably uses ice in the household to a greater extent than any other country. In Europe, for instance, the domestic ice box is almost unheard of, there are no "consumer's" ice companies and the general practice is to boil the milk and to do without such meats as will not keep in the summer. In this country, however, the demand is already created and it remains only to turn it into electrical channels—a feat which is fast being accomplished in the commercial line as pointed out in the two remarkable articles on refrigeration appearing on a later page of this issue of the Journal of Electricity.

Spare Time for the Government

The station operators of the Utah Power and Light Company have purchased an electric knitting machine, which they run in their spare moments, turning out socks for the Red Cross. The record to date is 115 pairs in a week's time besides other duties performed.

The idea is an original one and holds much to be commended. A station attendant, while by no means idle and often very busy, still has considerable time on his hands when only his presence is necessary—and he can operate a knitting machine without detriment to his other duties. War gardens and even creameries have become accessories of power houses abroad—and there is no reason why an outlet for patriotic service may not be found with greater consistency in the knitting machine. Incidentally machine made socks are considered 'almost as good' as hand knit and the only reason for not providing all in the more efficient way is because there are not enough machines to fill the need.

Summer Uses of Electricity in the West

Hot weather and vacation days have come to be looked upon as bringing a distinct type of 'summer business' to the electrical contractor-dealer and summer load to the power company. Fans and soda fountain mixers take the place of heaters and warming pads, both in the dealer's window and the manufacturer's sales helps. Local conditions modify even the seasons, however—and as in many other things, the problems of the West are slightly different from those east of the Rockies and the western dealer must add his ingenuity to think up campaigns and sales helps to meet his own situation.

A great portion of the Pacific coast region, for instance, has no summer in the sense of a period of intense heat and humidity. Here electric fans find no greater sale than in winter, refrigeration problems do not change and there is very little demand for porch fixtures and summer evening accessories. On the other hand, the hot dry summers of the interior, almost wholly without rain, provide the usual summer outlets plus irrigation demands. One company of Southern California reports supplying current during the past year to bring 75,000 acres of land under production by electric irrigation. The load is an almost constant one during the summer season when the pumps operate day and night and is steadily increasing, providing a summer opportunity for both contractor-dealer and central station. The increase in the electrical refrigeration load in this district is discussed elsewhere.

A summer opening uniquely Western is that to be found in the mountain camps and resorts as suggested on another page of this issue. The choice lies between electricity and wood for fuel in the inaccessible mountains—with a modern tendency toward the local development of water power and a new opportunity for the sale of hotel appliances.

The Report on Garabed

The commission of scientists appointed by a special resolution of Congress to investigate "Garabed," a new source of power, have reported unfavorably on the invention. They found that the inventor's model was not in shape to run or to develop power. Mr. Giragossian admitted that he had no working machine and that he was merely explaining principles. The committee does not believe that his principles are sound, that his device is operative, or that it can result in the practical development or utilization of free energy. The incident is apparently closed and added to the history of 'discoveries' which have blazed across the world's news and never materialized. Almost every year some inventor is reported to have assembled an engine which runs without the application of any known form of energy. These announcements are accepted skeptically but open-mindedly by the public and usually die down without even the trouble of an explanation. Probably very few people hoped much from 'Garabed'—but the revolutionary discoveries of recent science and the inventor's offer to stand all expense made the request for an investigation difficult to refuse. The tremendous strides in scientific knowledge gained within the last two decades have left us almost without the capacity for skepticism—and open to any fraud. Just as the former great period of discovery which involved the gift of the printing press and the opening of a new world was followed by an era of spiritualistic fakes and professors of natural magnetism, so the world today with the one miracle of wireless telegraphy in its mind is open for belief in almost anything. Mr. Garabed Giragossian in all probability was sincere in his belief that the principle of his discovery was sound. In any case, he has succeeded in obtaining considerable notoriety, while the world has not yet been turned upside down.

Electric Power Assumes Greater Resposibilities

The announcement by the United States Emergency Fleet Corporation of the immediate building of 42 new concrete ships totaling 298,000 deadweight tonnage has sent a thrill through the West for the "Faith," the product of a western seaport, has thus unquestionably justified its name and ushered in a new era in ship design.

In this type of construction electricity will again prove its usefulness in helping labor and in the hand-

ling of concrete. All that is needed for concrete ship construction is a simple plant. This is made up of concrete mixers, hoists, and other plain equipment which is obtainable in any large city. Such a plant can be rapidly put together, leaving only for additional construction the ways similar to those used for wood and steel ships.

According to the Emergency Fleet News the estimated cost of building a wooden ship is about $165 a ton complete, and that of building a steel ship about $180 to $220 a ton complete. The estimated cost of concrete ships is between $100 and $110 a ton complete. The difference is, of course, brought about by the saving in equipment, time, labor and material. Compared to steel material, the saving by the use of concrete often amounts to from 50 to 55 per cent. It is also a simple process to repair concrete ships. They can be repaired while in water, without having to be put in dry docks.

The five Government yards will be located at various points on our coasts. Construction of one of these yards at Wilmington, N. C., is already under way. Others will be at Jacksonville, Fla., Mobile, Ala., and San Diego, Cal. The fifth yard is that at San Francisco, of the San Francisco Shipbuilding Company, which built the "Faith," the first concrete vessel. This company has been given an agency contract for eight concrete ships. There are also two private concrete shipbuilding yards, one at Brunswick, Ga., the other at New York City.

This new innovation in the shipbuilding industry will undoubtedly continue to be watched with the keenest interest. Once again the gigantic natural resources of the West in its possession of raw materials for concrete and unlimited power supply augur much for a new and profitable use of electric power in this growing section, for all time to come.

Need for a Co-ordinated College and University

Each day brings to light the need for greater and more effective service. Men of the electrical industry throughout the West are learning in these strenuous days to accomplish results through coordinated effort that were never dreamed as possible in former days.

The time has now come for universities and colleges to awaken to the immensely broadened field of opportunity before them. In British Columbia to the north already educators and engineers are alive to these new calls to service. The better to enable returned soldiers to resume civilian occupations after convalescence vocational schools are being established in connection with the military hospitals in Vancouver. Up-to-date machinery and electrical equipment are being installed in those institutions, where there are also competent instructors in modern arts and crafts.

This is but the beginning of a new era in educational ideals. Our universities and colleges are soon to learn, due to enforced circumstances, the blessings that the electrical industry has experienced from coordination and interconnection. State regulating commissions, in looking into the details of utility life have exploded the fallacy of competition and duplication of service.

The most casual inspection of university and college reveals the vast duplication of equipment that exists in neighboring institutions. Undoubtedly the immediate future will reveal the fact that university spirit must be broadened into the greater university ideal that knows no one institution nor boundary in its service.

Here then, in the coordination of university effort and the segregation of certain definite educational tasks for each institution, thus ushering in the greater university ideal, is an opportunity for helpfulness that will not only vastly forward educational ideals as a whole but raise to a higher plane of usefulness all technical branches of industry and at the same time effect a saving in effort and expense that has in recent years advanced to huge totals.

"Tying-in" with Publicity

Much has been said recently in the technical press of the country relative to the necessity of the Electrical Contractor and Dealer "tying-in" with the great national campaigns of publicity that are being conducted by manufacturers the country over and thus taking advantage of the vast effective advertising that would otherwise be impossible for them to enjoy, due to the gigantic expense involved.

This matter of working in synchronism with all great publicity movements of the hour is too often overlooked. On all sides a prodigious waste is to be observed. The university and college fail to reach the engineering field due to a lack of grasp of the condition to be met. The engineer too often fails to take advantage of the publicity available to him through the great national engineering societies or the technical press and so on down the line.

In the case of the merchandising of electrical ware, however, the enormous opportunities available to the contractor-dealer should not be overlooked.

Most electrical manufacturers have adopted the wise policy of continuing their full allotment of advertising in spite of war conditions and of orders which often exceed the factory output. There is wisdom in this policy only if the advertising is being turned to actual account by the retail dealer, for the campaigns which are aimed to raise the electrical industry in the public's estimation must take actual effect through the unit channels which reach the customer—or the public interest will lapse and the money spent in advertising be wasted.

A casual glance at the great national magazines and what they are selling in electrical lines will pay big dividends if due care is taken on the part of the contractor-dealer to tie-in with his daily activities of display and effort at selling.

NEW JOURNAL SERVICE: A new contribution toward the solution of practical problems of the day, too recent to have yet found their way into books, is made through the papers and discussions of our electrical conventions. Several important meetings will be held in the Northwest during the month of September, notably that of the Northwest Electric Light and Power Association which takes place in Portland, September 11th to 13th as well as the usual Contractor-Dealer gatherings which follow closely thereafter. Advance papers of these conventions as well as convention notes and discussions will be featured in the September issues of the Journal of Electricity.

ELECTRICAL INSTALLATION AT CAMP CURRY

(A unique summer opportunity which the West offers for the uses of commercial type appliances in mountain camps and resorts. The most complete installation west of Chicago with a possibility still to be developed.—The Editor.)

SOME OF THE TENTS

The camp itself which covers several acres, is lighted by electricity

A CAMP four thousand feet above sea level where the guests sleep in tents and live out of doors is not the place one would ordinarily look for extensive applications of electrictity. But the proximity of almost limitless water power and consequently cheap rates for electricity, together with the motto of "service" which the camp holds have combined to point the way to a wide use of electric appliances at Camp Curry, Yosemite Valley, California.

To Furnish the Current

Up to this year the government power house situated at the head of the valley has not been capable of an output sufficient to carry the increased load which electric cooking means, nor have the requirements of the camp demanded it. Steam engines and oil ranges have satisfied heat and power requirements.

To give some idea of the large amount of current required—the cooking load of this camp alone amounts to about 125 kw. plus several motors, a small heating requirement and the entire lighting load. While the burden was being carried by the old power house in the early part of the season it was figured that the Curry load almost equalled that of the general valley demands, although these included the lighting of main roads, the village requirements and another large camp (without special electrical features, however). The peak load occurred at the unusual hour of from 4 to 5 a. m.—the time when the largest amount of baking was being done.

Electric Lighting in the Valley

Even in former years, electricity was used throughout the camp, as in the valley itself, for general illumination. The camp is designed for a capacity of one thousand or more and has been known to register a far larger number. There are some six hundred tents which are arranged in irregular streets. These avenues and the numerous administrative buildings were all electrically lighted, partly as a lessening of the fire hazard and partly on account of the difficulties in transportation and in care, as well as the unsatisfactory results, involved in other forms of illumination.

Complete Electrical Equipment

Recently electric heaters have been added as special features for some of the tents for use in the early spring and late autumn. The new cottages which have this year been added to the camp are further provided with electric water heaters, and are electrically lighted throughout.

The important innovations, however, are those of the kitchen department. Here the large oil range has been supplemented by two Hughes electric hotel type ranges of 22 kw. each, making a total of 44 kw. The great advantage in the use of electricity is found in the doing away with the fuel difficulty—(neither coal nor gas is available, of course, and the valley is some fiften miles from a railway) and in the great convenience of heat regulation. The range is started in the morning at full heat to warm it up, and switched later to the medium unit, establishing an even temperature. During the serving period, the

THE NEW KITCHEN INSTALLATION

The electric griddle is mounted on an old wood stove in the foreground, with the two electric ranges to be seen beyond. Situated 4,000 ft. above sea level, electricity is the most available fuel.

low temperature is sufficient and permits the range to be used in part as an auxiliary to the steam serving table.

In this same division of the kitchen, an hotel type electric toaster of 3 kw. has been installed. This has three racks allowing a large quantity of toast to be made at one time and has proved one of the great conveniences of the new installation. A 25 kw. Hughes electric bake oven is housed in another division of the kitchen buildings. This takes the place of an old fashioned brick oven in which wood was used for fuel. It was formerly necessary to start the fire some hours before the use of the oven —now the heat need only be switched on. The new oven has three compartments into which the large pans fit. These are to be electrically lighted on the interior, permitting inspection of the food while baking. An accurate record of the temperature is shown on the registering thermometers and the heat may be regulated at will. In connection with this department an electric mixer greatly lessens the labor of baking for a thousand or more guests.

Three electric dishwashers of the Peerless type

and a recently installed 9-kw. Hughes hotel type griddle complete the kitchen equipment. With a dining room which seats over 500, the dishwashing itself amounts to considerable of a problem—and the electric washers have materially decreased the time required for the task as well as the number of workers needed.

Future Possibilities

The laundry, which is an extensive installation housed in a building of its own, is very completely outfitted. A small and large washing machine, an extractor and a tumbler are all run by steam, leaving an opportunity for the further application of electricity in the future. Eight electric irons are in use in the main room, as well as two on the porch for the private use of the help.

PROVIDED WITH ELECTRICAL WATER HEATERS

The new bungalows have electric lights, electric water heaters and heaters for the sleeping room, if desired for chilly nights. The 3000 ft. face of Half Dome is seen in the distance.

Steam is further used in the small refrigerating plant attached to the camp and in the turning of the ice cream freezers which freeze with a brine mixture, as well as for the heating of the swimming pool and the main dining room in winter. The steam serving table, of course, is steam heated as its name implies and an additional dish warmer completes the steam equipment.

Even an Electric Saw Mill

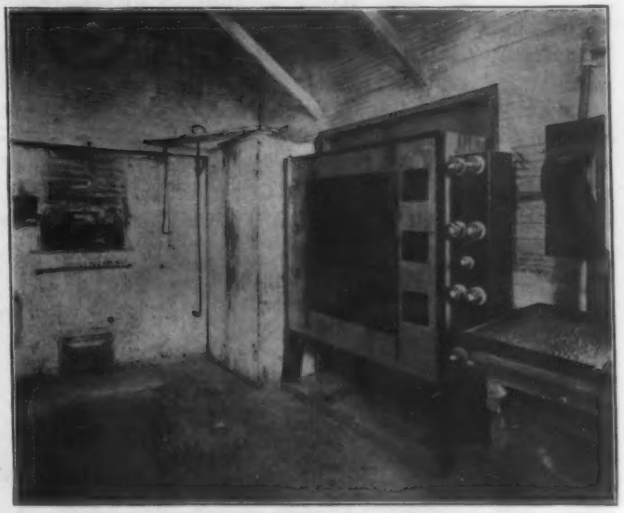
The small saw mill, however, is electrically operated. A great deal of carpentry work is carried on at one time and another in the construction of new buildings and in the rustic fencing about the camp, as well as in repair work which is continually needed. This is handled by the camp mill which is provided with a motor and a small rotary saw.

The New Power Plant

These installations and the further additions contemplated were made possible by the construction of the new government power plant situated some two to three miles below the valley proper. The power of the falls has never been utilized but the rapid slope of the land at the upper end of the valley itself as well as below at the Cascades has made this unnecessary.

The new plant has a capacity of 2000 kw. with a present output of 1000 kw., entirely adequate to meet all present and probably all future demands of the valley. The log crib dam, timber faced, is located about one mile below the Pohono bridge. A concrete diverting chamber with grizzlies, waste way and intake from the structure here. The iron sluice gates are operated by geared mechanism located on top of the concrete intake structure. A 54-in. concrete pipe (in contrast to the 17 inches of the old plant) carries the water beneath the highway and from thence a wood stave pipe some 5300 ft. long conducts the water, partly on a bench along the hillside and partly on trestles, to the steel penstock. A 42-in. steel pipe 800 ft. in length carries the water down to the level of the power house where it is delivered under a 336 ft. head. The pipe is good for 93 sec. ft. but under the present conditions for the generation of only 1000 kw., only half that amount is utilized. Two 1250 kva G. E. 2300 volt, 30 cycle, 3 phase, a.c. generators of 720 r.p.m., direct connected each to a 1500 hp. Pelton Francis turbine, furnish the power. The exciters are 10 kw., 125 v. direct connected. Three transformers, oil cooled of the outdoor type, 60 cycle, 400 kva located at the plant, step the current up to 11,000 voltage, at which it is transmitted over some 8 miles of wire to the valley. Here it is stepped down to 2300 v. which is the ordinary voltage for valley use.

The power house itself is of concrete and steel construction in attractive architectural design. The approach is by means of the main El Portal highway. The cost of the entire installation was upwards of $220,000.



FROM WOOD TO ELECTRICITY

The old oven is to be seen in the rear. The new electric apparatus is not only more convenient to operate but it bakes better bread.

The new plant was built by Galloway and Markwart with G. L. Bailey, associate. The Hughes Division of the Edison Electric Appliance Company through the Western Electric Company had charge of the installation at Camp Curry.

General Satisfaction

The installation to date has given every satisfaction and owing to the reasonable rates for power which compare very favorably to the cost of wood and to the price of fuel oil delivered at the valley, even further extensions are planned in the future.

THE OPPORTUNITY OF ELECTRICAL REFRIGERATION

BY H. N. SESSIONS

(One of the most extensive summer uses of electricity at present with enormous possibilities for the future. The Food Conservation Program increases the demand for large refrigerating units and new methods of ice making promise the extensive substitution of electricity for steam. An unusual opportunity open to the man who perfects an inexpensive plant for domestic use. The author, who is well known as an efficient commercial engineer, is with the Southern California Edison Company.—The Editor.)

Ice to ice is as true as "Ashes to ashes." Snow on the peaks of the high Sierras is Nature's cold storage of enormous hydro energy which, released during summer, is transmitted electrically to the distant ice and cold storage plant. Thus it is clear that the perpetual supply of "white coal" may be used not only for the conservation of fuels, but the saving of vast quantities of perishable food, so necessary at the present time, by means of electrical cold storage.

A block of electrically made ice or quantity of refrigerated produce represents stored kilowatts hours just as truly as the charged storage battery.

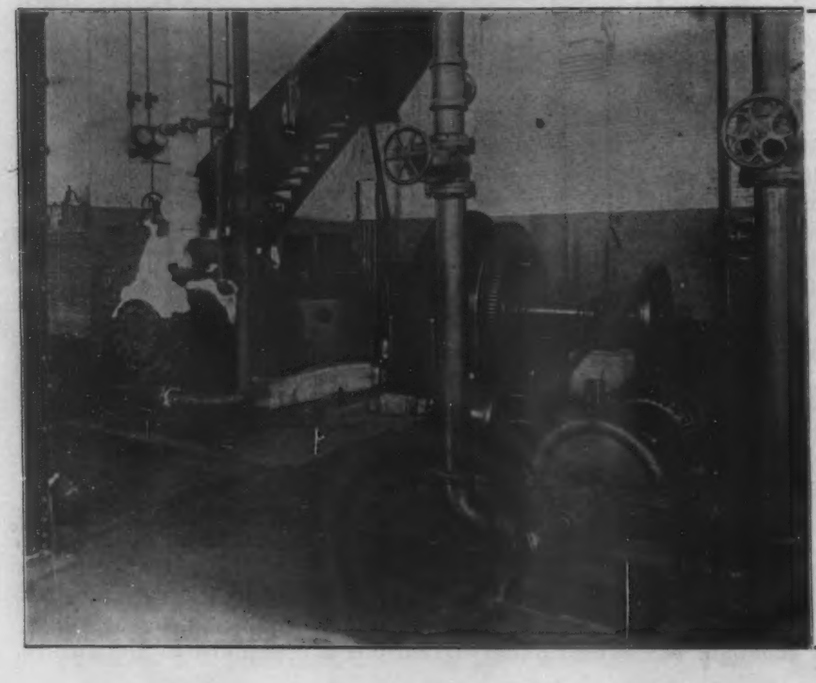
The storage of melted ice behind the dam, during off peak season, is the electrical engineer's answer as to "how to fill up the valley." Ice made electrically, at off peak hours, is one of the commercial engineer's answers as to "how to fill up the valley".

Is electrical refrigeration entirely practicable? Yes, absolutely, for many reasons.

Electricity has made refrigeration flexible. Just as added heat or the increase of temperature electrically is so often essential during the course of converting raw material to the finished product, just so often is the subtraction of heat by electrical refrigeration necessary.

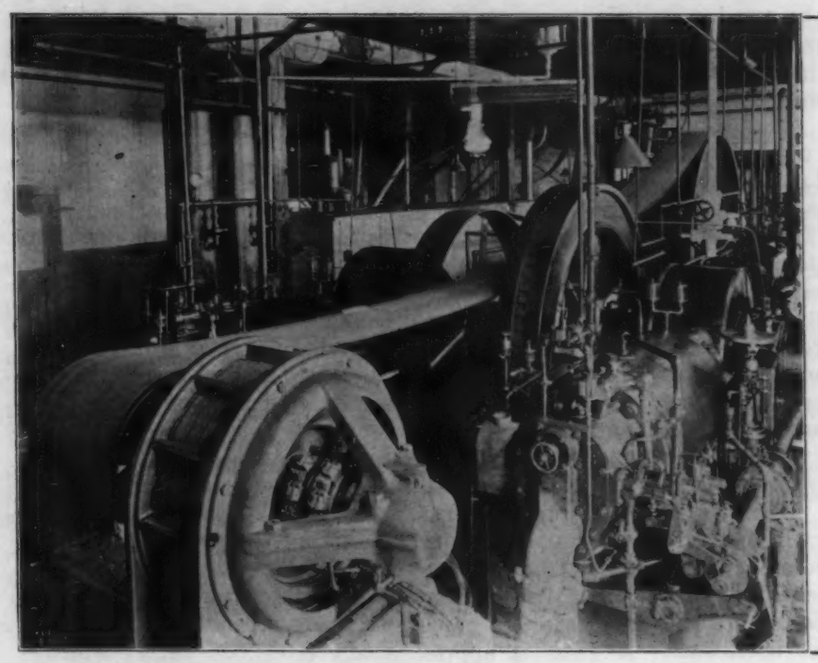
Putting it simply, the refrigerating machine is a heating device, negatively speaking; the heat being subtracted from it instead of being added to it as in a boiler. Even to the layman it must stand to reason that it is more economical to reduce a pound of water from normal temperature of 70° F. to 32° F. into ice, than, as is necessary in a steam plant, to raise a pound of water from 70° F. to at least 212° F. and then lower it again to 32° F. The steam engineer's excuse for this waste of heat has been that it was necessary to de-aerate and distill the water by steam in order that the ice product would be transparent and pure. Distilled water from the boilers in a steam plant may be, and often is foul, due to its taking up oil or other substances in its passage through the engines, pumps, etc. on its way to the point of condensation. The "Plate system" and the now popular "Raw-water system," either of which will produce clear, transparent, pure ice from ordinary untreated water, require no steam in the processes.

In ice plants where it was thought necessary to distill the water with steam before freezing, the steam used being from the exhaust of a steam engine, a marked improvement was introduced a few years ago by the adoption of the multi-effect evaporator or multi-still. This machine operates on the principle that less heat is required to evaporate water under vacuum than under atmospheric pressure. By its use it is possible to evaporate as high as 75 pounds of water per pound of oil and secure distilled water free from oil at a very low cost for freezing purposes. The adoption of the evaporator made it possible to definitely separate the cost of distilling by steam from the cost of steam for power purposes. As the cost of operating by a combination of the electric drive and evaporator proved to be less expensive than an all-steam operation, the Southern California Edison Company was enabled to make



MOTOR FOR AMMONIA COMPRESSOR

A 390 hp. synchronous motor direct connected to a high speed ammonia compressor—200 r.p.m. The power for driving the ammonia compressors in ice and cold storage plant usually amounts to about 80% of the entire power requirement. The usual motor installation of an ice plant including all auxiliaries is approximately 3 hp. per ton of ice to be made each 24 hours.



THE OLD WAY AND THE NEW

A 150 h.p. semi-Diesel engine supplanted by an induction motor to drive the ammonia compressor. Due to the slow speed of the steam engine and its great weight, steam necessitates a slow-speed ammonia compressor, whereas with the use of electricity, it is now possible to use a comparatively light and high speed compressor, attaining increased refrigeration efficiency. For this reason as well as the convenience of lights and wiring, the electrically operated plant costs less to install.

considerable headway in displacing steam power.

The "Raw-water system" of making ice entirely eliminates the necessity of distillation and the evaporator, thereby making possible the entire operation of the ice plant electrically. This system necessitates a modification of the freezing can, because it is necessary to agitate the water during the freezing process. The water is usually agitated by compressed air, although several other methods can be employed. Water, in freezing, liberates its entrained air, gases and impurities, which are carried off by agitation. In this system of freezing, small crystals of pure ice first form on the walls of the can, and as they form, the impurities, being more capable of solution in water than of being frozen into the ice, are removed by the water which has not been frozen. With the proper agitation of the water, solids, and matter held in solution or suspense are pushed ahead of the freezing ice and concentrated in the center of the can. When a comparatively small amount of water is left still unfrozen in the core or center of the block, which water contains practically all the impurities originally in the can, this core is then removed and the small space left refilled with clear water and the cake is frozen solid. Raw-water ice is more sanitary, palatable and free from odor than that made by any other system. The cake is transparent and has a slight, feathery appearance in the center.

The Southern California Edison Company is supplying electricity to one ice company alone using approximately 2000 hp. in motors to displace steam and manufacture raw-water ice in connection with cold storage.

The very purpose of an ice and cold storage plant is to lower the temperature below normal; hence there must be in a steam refrigerating plant considerable conflict between parts held at low temperature and the many heated sections of the steam system, and a consequent loss of energy which is entirely eliminated by electricity. In other words, steam is hot—electricity is cool. The Mazda light was made for the cold storage room. Out-of-the-way wires and switches are cheaper to install and easier to handle and maintain than in-the-way pipes and valves. The cost of installing an electrical ice-plant is considerably less than a steam plant. Due to the slow speed of the steam engine and its great weight, steam necessitates a correspondingly cumbersome, slow speed ammonia compressor, whereas the refrigerating engineer finds that with electricity it is now possible to use a comparatively light and high speed compressor occupying far less space and attaining increased refrigeration efficiency.

It is estimated that the Nation's growth of the ice and refrigeration industry is 30% for the past year and that there are at present over 40,000 refrigerating machines in the United States, representing an investment of about $500,000,000, directly affecting products valued at more than $4,000,000,000. When the conservation of food and perishable material, and the added production due to the widening of markets, is considered, a conservative estimate is that at least one-half of a billion dollars is added annually to the wealth of the people of the United States, beside contributing enormously to their comfort and convenience.

Is electrical refrigeration most economical? Let us see.

In the manufacture of the average article, the power cost is from two to five per cent, while in ice making it ranges between 30 and 50 per cent of the total cost of production. Hence in this industry the cost of electric power largely affects the cost at which ice may be manufactured.

The usual motor installation of an ice plant including all auxiliaries is approximately 3 hp. per ton of ice to be made each 24 hours. That this is liberal may be judged from the fact that several large ice plants electrically served by the Southern California California Edison Company show an average kw.hr. consumption for the year of less than

50 kw.hr. per ton, running below 40 kw.hr. per ton in winter and slightly above 60 kw.hr. per ton in summer. The power consumption to refrigerate a ton of the average produce is usually estimated at half that required for ice making.

Due to Southern California's mild, even climate, there is a constant demand for ice and cold storage, and the majority of large refrigerating plants require to operate practically all year at full capacity. Operating records of several large electrical ice and cold storage plants in Southern California, in respect to electric power consumed, show a monthly load factor of 90% and an annual load factor above 80%. Such a load factor with the power factor close to unity on account of synchronous motors which are preferable for the work, makes the character of the business ideal and earns from the central station a sufficiently low rate per kw.hr. to justify the replacement of steam by electricity.

The labor cost of operating electrically has long been recognized to be lower than with steam, and the hazard of fire and accident is also less. It must not be forgotten that the ice plant also enjoys the same rate for electrical energy for other uses, such as the electric truck, and the fact that the electric truck is perfectly suited for ice delivery makes it a certainty that the electrical transportation of ice for short hauls is unquestionably the cheapest and best.

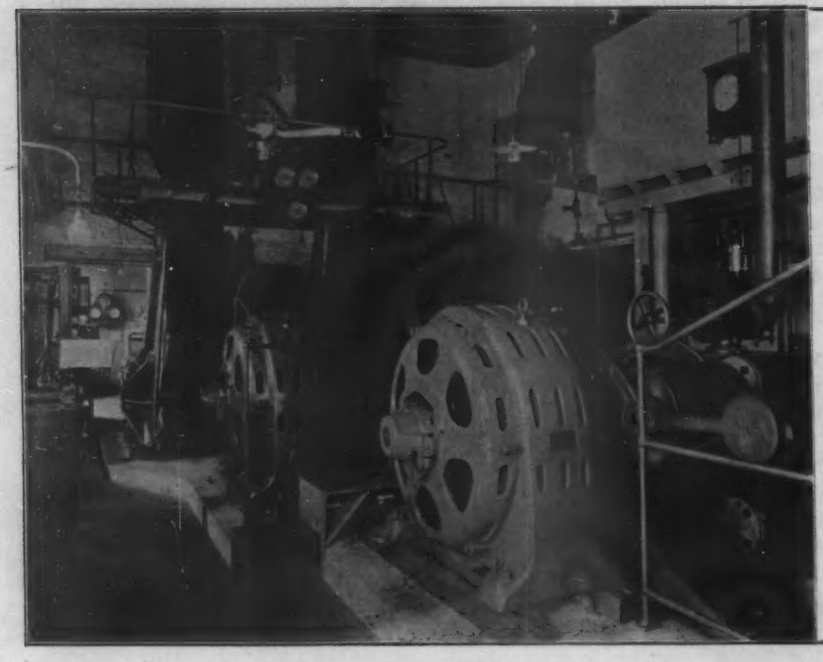
The power for driving the ammonia compressors in an ice and cold storage plant usually amounts to about 80% of the entire power requirement, and is best supplied by a synchronous motor assuring unvarying speed which is most desirable.

The Southern California Edison Company has pioneered the manufacture of ice electrically without the use of steam. As early as 1892 this company installed a 200 horsepower synchronous motor to operate an ice plant where no steam whatever was employed and this plant operated successfully for 25 years. The same motor today is operating an ice plant, seemingly none the worse for wear, with an electrical efficiency equal to the best present-day motors. This plant was installed in a locality where every condition favored electricity, such as being near a hydro-electric source where other fuel was costly.

Electrical refrigeration has made its greatest stride since the war began. Perishable food must be saved, and the Nation's appeal to all ice companies to equip cold storage space to save farm products during crop time is of great significance. The Council of National Defense has authorized at least fifty millions to be expended for cold storage facilities at seaboard points. Even in France our Government has already erected cold storage warehouses with a daily capacity of 1500 tons of foodstuffs for the American soldiers.

Southern California's growth in ice-making and cold storage plants in Los Angeles, including packing houses, today represent an investment of over $4,000,000, and a total horsepower installation of about 10,500 hp., 60% of which is electrical. The cold storage capacity of the various plants in Los Angeles is approximately 5,000,000 cu. ft. storage space and this year's value of the products in cold storage is estimated at $3,715,000. These products are beer, cider, vegetables, nuts, fruits, cereals, fish, furs, poultry, meat, butter, cheese, eggs, ice, etc. Each of these must separately be held at a constant, unvarying temperature, although to a different degree in each case,—for example, fish 15° F., furs 26°, eggs 31°, potatoes 38°, etc. Without refrigeration, our annual shipment of 35,000 cars of citrus fruits and 5000 cars of melons could not be marketed.

Through the means of electricity, we find refrigeration applied to practically 150 separate industries, some of the most important having to do with photomaterial, silk manufacture, leather from hides to the finished product, tobacco, dyes, extracts, glues, electrical apparatus, explosives, floriculture, horticulture, gelatine, mercerizing, petroleum products, per-



STEAM ENGINE DISPLACED BY ELECTRICITY

The Council of National Defense has authorized at least fifty millions to be expended for cold storage facilities at seaport points. In France the U. S. Government has erected cold storage warehouses with a daily capacity of 1500 tons of foodstuffs for the American soldiers. With the normal load increase added to this, it can be seen that the increasing substitution of electricity for steam means a power load of considerable importance. The illustration shows a 200 hp. Corliss steam engine displaced by 175 hp. induction motors.

fumes, rubber, shaft-sinking, blast furnaces, auto factories, laundries, paper manufacturing, the textile industry and many others.

There is no question which is put to the refrigeration engineer any oftener than "Can I get a small refrigerating machine for my home?" This very small "domestic machine" as we term it in counter-distinction to the small ice plant for markets, etc., has a wide field for use. Its development has received a vast amount of study; however, unsolved problems still confronting its successful and economical operation and its high initial cost, make it more or less an uncertain luxury which few care to try. The interest alone on the present cost for such a machine is more than the average family invests for ice, and the up-keep is likely to be more than the interest cost. However, when this type of machine is perfected to the degree of the Ford, and it certainly will be, ten machines can be sold to every Ford. On a basis of the cost and selling price of the domestic refrigerating machine as compared with the "Fliver," some Henry Ford will market the coming home electrical machine for about $50.

It is needless to dwell on the recognized success and economy of the small electrical refrigerating plants being almost daily installed in cafes, markets, apartment houses, etc. in Southern California.

Wherever steam power has been available and cheap, the leaning, up to a few years ago, has been toward steam and against electricity. However, the opposite holds today in Southern California to such an extent as to make the use of steam obsolete hereafter for ice-making. Steam power for any purpose at the present war prices of oil has forced practically every large ice plant in Southern California to operate electrically and in doing so the ice-makers have discovered that the objections to electricity raised in the past by steam engineers are mere fallacies.

The manufacture and operation of ice-making machinery now realize electricity is leading them into an entirely new field for improvement and lower cost of making ice that could never have been exploited with steam, or, it is needless to say, the Diesel engine.

HOW ELECTRICAL REFRIGERATION PAYS

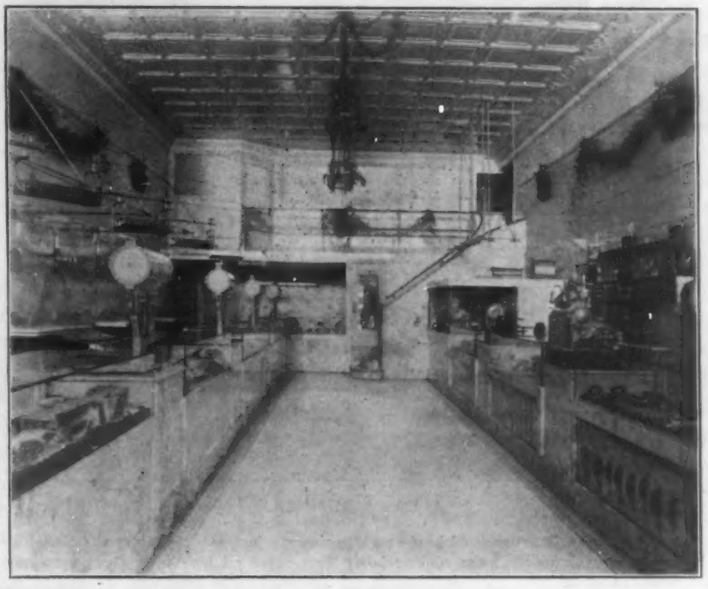
BY I. W. ALEXANDER

(A butcher shop with a complete electric refrigeration system which cashes in on its investment. An opportunity suggested to the contractor-dealer and the central stations together with a live selling argument. The author, who is well versed in the summer uses of electricity in the central valley of California, is with the San Joaquin Light and Power Corporation.—The Editor)

Psychology and the butcher shop!

At first thought one asks, "Well, what's the connection?"

The answer is, "A very intimate connection," and the California Market Company, of Bakersfield, has proved the fact. It has fitted up one of the most attractive sales and display rooms in the West—a marble and tiled interior and exterior with heavy plate glass display cases and counters and mirrored walls, cooled throughout by an elaborate motor driven refrigerating system having frost covered pipes and coils lining the display windows and counters. It is not difficult to surmise a selling power thus directed upon a customer stepping into this establishment on a summer afternoon when the street thermometer registers an out-of-doors temperature of 100 degrees or more.



IMPRESSING THE CUSTOMER

View of California Market Company's unique butcher shop in Bakersfield, showing Alaskan marble finish of interior and attractively arranged display cases and counters. This concern is known as the largest wholesalers or retailers of butcher products in the San Joaquin Valley, handling some 55 tons of meat in one day—and electricity had much to do with its success.

"Psychology in salesmanship? Most certainly, and lots of it," is the enthusiastic testimony of Mr. L. P. Keester, president of this company. And Mr. Keester knows whereof he speaks, for the California Market Company is known throughout the great San Joaquin Valley as the largest wholesalers and retailers of butcher products.

"Psychology and electricity are the two leading factors in the development of our business" declares Mr. Keester. "By a judicious application of electricity in the operation of all departments of our plant we have been able to display our products in a manner to attract customers and invite purchasing. A satisfied customer is the foundation of all business. We not only strive to satisfy our customers but we endeavor to make the customary visit to the butcher shop an anticipated pleasure."

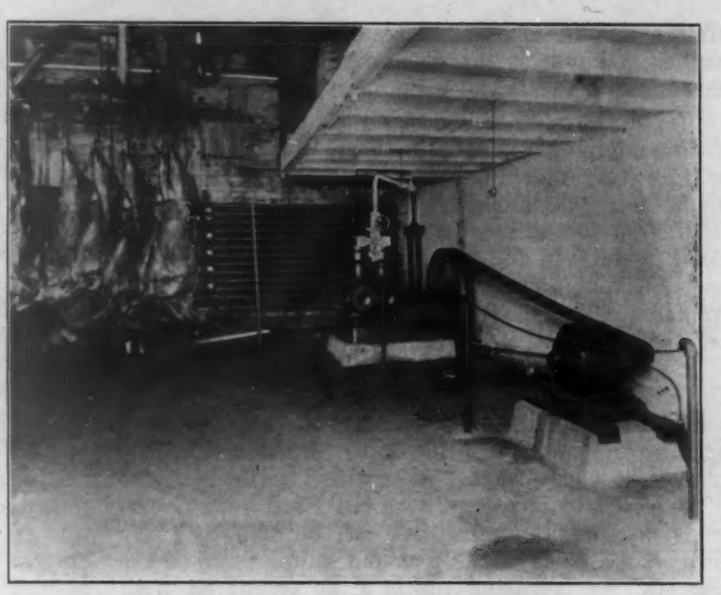
The first step in the creation of this unique establishment was the installation of the most attractive sales and display room architects could

design. Alaskan marble was used throughout and with the tiled floors the result is particularly pleasing to the eye.

The appeal to the inner man is made by the presence of frosted coils above the different choice cuts of meats, poultry and fish on display in the cases. Coil lined display windows show from the street similar cuts of meats and at times whole sides of beef, lamb and other meats, and in the summer melons and other fruits. Window displays of course are made in season. Thanksgiving and Christmas shoppers find a variety of turkeys, cranberries, oranges and vegetables to select from. The result is high type purchasing.

Refrigeration is produced by an 8-ton Vulcan direct expansion machine driven by a 15 horsepower General Electric motor. This machine serves the huge cooling box with many different compartments for the storage of tons of meats, poultry and vegetables, and also the system of frosted coils and pipes in the display room.

All the machinery in the sausage making department is motor driven. The cash carrier system and counter scales are also electrically operated. In fact the universal use of electricity in this establishment has earned for it the name of the "Electric Butcher Shop."



THE "ELECTRICAL BUTCHER SHOP"

The refrigerating plant which helps to earn this name for the market. The view shows a 15 horsepower General Electric motor operating an 8-ton Vulcan direct expansion refrigerating machine serving huge storage cooling box, one corner of which is seen in the background. This machine also serves the system of frosted pipes and coils in the display cases and windows of the salesroom which add greatly to the attractiveness of the department.

A DAY'S BUSINESS

A part of the day's delivery of beef and other meats just received from the slaughter house on its way to the huge cooling box. This gives an idea of the great amount of meat handled.

A more definite conception of the capacity of the plant is obtained from the huge business it handles. A normal day's output—wholesale and retail—is 20 tons of beef, 15 muttons, 10 veals and 10 hogs in addition to sausage and other biproducts. A huge output in seasonal fruits and vegetables also forms a part of the company's business. It has among its largest customers many of the big oil and contruction companies operating in the Kern river and West Side oil fields of Kern county, and in the past it has supplied meats and produce for the thousands and thousands of men employed in the hydro-electric developments of the Pacific Light and Power, Southern California Edison Company and San Joaquin Light and Power Corporation in their respective Kern River projects.

A GET-TOGETHER CO-OPERATIVE DINNER

A get-together dinner of the California Electrical Cooperative Campaign will be held at the Fresno Hotel at 6:30 Friday evening, August 2nd. This gathering will hear the full story of the campaign as told by members of the Advisory Committee and will further be addressed by A. E. Wishon, general manager of the San Joaquin Light and Power Corporation. Arrangements for other speakers are being made. All those interested in electrical matters from the San Joaquin Valley Section, from Modesto to Bakersfield, are expected to attend.

THE RETAIL TRADE FROM THE MANUFACTURER'S STANDPOINT

BY J. NELSON SHREVE

(The Goodwin Plan in its practical application from the standpoint of the manufacturer. The question of discounts and selling policies as set forth in a recent paper before the Convention of Electrical Contractors at Saratoga Springs. The author is president of the Electrical Cable Company of New York.—The Editor)

At times it seems as if the manufacturer's interest often ended at his own shipping door. Nowadays more and more manufacturers are realizing that in the electrical business the retailer possesses even more power to make or mar the product of a manufacturer than in other lines of industry where less engineering is involved. Besides this consideration of the contractor's ability to assist in the engineering end we have a consideration of the fundamental economic principles of all business. Unless these are understood and industry based upon them, its foundation is of sand. In the past there have been too many sand foundations. It is true we are getting away form this period which was due largely to the fact that economic principles were regarded as purely academic. The idea of applying them to every day commercial life was thought to be Utopian. If they are sound they are practical, a truth which every business man must recognize. As a nation we have in the past been handicapped in our industrial development by too much individualism, and too many laws supporting it. We are just entering on the age which older nations entered years ago—the age of co-operation.

A business cannot be practically successful unless it is theoretically sound and conversely, the carrying of sound economic theory into effect is not Utopian—it is the only practical thing to do.

Efficient co-operation is possible only when the functions of every factor in an industry are clearly understood, and their interrelation honestly recognized by everyone in the industry, and when each is supported by all in the exercise of its proper functions. This is the only sound basis for practical co-operation, and it seems to me no one has presented this so clearly as Mr. Goodwin.

So far as the electrical industry is concerned, there are two primary parties to every transaction—the manufacturer and the ultimate consumer or, I might say,—the public. A sale is not completed until the goods are in service, the final payment made, and the public's approval obtained. This approval does not depend solely upon the manufacturer, and it is not determined immediately but only after satisfactory service for years. Between the manufacturer and the public are interjected several important factors: The jobber upon whom many manufacturers depend for the distribution of their product, and the contractor who installs it. The architect and the engineer are also important, though indirect factors, as they are responsible for planning the electrical system and advising the ultimate consumer as to the quality of materials. However, the manufacturer is principally concerned with the jobber and the contractor. The foregoing is general, and I shall now consider specifically the points raised.

The manufacturer must at all times be conscious of his responsibility to the public, if he would secure and hold its approval. This is the very essence of a successful business policy. It means that his goods must be of a quality that will insure their rendering the public efficient service. In establishing prices he must consider the following:

(1) What are the most economical units in which he can manufacture?

(2) What is a fair additional cost for disbursing them in quantities ordinarily used by the wholesale trade?

(3) What further costs are justified when distributing goods in quantities suitable for the retail trade?

These are important considerations in cost accounting, and any manufacturer who ignores them is fooling himself, as well as the public. Recognition by the manufacturer of the service function fulfilled by the electrical jobber and the electrical contractor takes the form of discount. Now everyone, I believe, will agree that there are only two reasons for discount—quality and service, either or both. A concern that claims maximum discounts from a manufacturer on any basis but that of quantity and service, should not have the claim recognized. The fact that a concern is in the electrical jobbing or the contracting business, or a member of an association, is not sufficient reason for according the recognition asked for. To do so would be unjust to those whose services entitle them to the maximum consideration. Manufacturers' selling schedules should be arranged on a basis of differentials which attract and encourage the wholesaler to buy so as to render maximum service to the manufacturer, the jobber, and the consumer.

Reputation, which forms the basis of business building, necessarily plays an important part. What encouragement is there for a manufacturer of high quality materials to give the maximum recognition to a jobber or retailer, whose policy is formed solely on price? Or to a contractor who sells his services not on the basis of quality but of cheapness? None whatever. In the first instance, he is encouraging the inefficient distribution of his product; and in the second instance, he is promoting a quality of work that may make it impossible for his goods to render the service they are capable of rendering. The result is loss of the public's approval. I am presenting no new thought. The facts I have called attention to are well known but they are not always given proper consideration in establishing a sales policy and, therefore, reiteration is justified.

I know the argument that will be advanced in some quarters in opposition to this policy. It will be said that theoretically it is all right but that competition makes its full practical application impossible. This is not true. The policy is all right in

theory and in practice; it is the only sound, economical policy; it can be applied fully and continuously. I know this is true because I have studied it in older industries and other branches of the electrical industry, and have proved it in my own company. I make this latter assertion because first hand experience is the most convincing. The public does not demand unfair competition but it wants all that it pays for. Think of the leading concerns in any line of business. Have they attained their position by selling cheap or by selling on the basis of service and quality, with the recognition of the fundamental principles of all business? The question answers itself. It is not worth while wasting time on a prospective customer to whom you cannot sell policy, quality, and service, as well as material.

A CONTRACTOR'S VIEW REGARDING PRICES

BY FRANKLIN C. GREEN

(Raising the margin of profit without injustice to customers. A suggestion which has been gaining ground in the Northwest for a reclassification both of purchasers and prices, with the aim of providing a fair return for the contractor-dealer. The author, who is connected with the E. L. Knight Company of Portland, has been active in this advance among Oregon contractors.—The Editor.)

Classification of Customers—

In talking with other electrical contractors I find that, although they have local problems, in general these are very similar regardless of location. It is more difficult doubtless for the contractor than for others in the electrical field to see beyond his immediate surroundings. The broadening of vision constitutes to my mind one of the greatest functions of, and values of, a constractor's organization, and discussions in such bodies often are concerning prices.

Much progress has been made along organization lines with benefit to all concerned, and while the present contractors' situation as compared with former years is much improved, we still have many problems yet to be solved. The great difficulty which we have always had, and will continue to have, is in connection with what is called the "Classification" of customers. We have now, broadly speaking, three classifications:

First: Those entitled to dealer's prices.
Second: Those entitled to trade prices.
Third: Retail.

Dealers' prices are those to which contractors, central stations and other users in wholesale quantities are entitled.

Trade prices are those which many firms, industrial institutions, and the like, whose volume of purchases entitles them to a concession in price, receive. A differential of about ten per cent now exists between dealer's and trade prices.

The third classification needs no special explanation, but it is, generally speaking, the ultimate consumer.

A Revision of Classes—

Now by virtue of practice, custom, expediency, necessity or otherwise, an extraordinarily large variety of buyers are in the first two classifications. Hence the contractor's problem has been how to secure business from a concern that buys as low as, or within 10% of his price. In fact, contractors frequently suffer loss because of comparison between the prices at which he bills and prices quoted by jobbers. It might help matters if it were possible to reclassify these buyers, particularly if the contractor could have a voice in the reclassification, by eliminating in so far as possible all those now incorrectly listed in the first two classifications and placing them in the third.

However, while a revised classification might help it would not entirely solve the difficulty from all angles, as experience locally has shown. This is due largely to the fact that the personal element enters and various interpretations are bound to be made. Really some of the peculiarities and absurdities that have arisen in connection with our present classification have been ludicrous.

The question then of doing business with buyers in these classifications, which also include all industrials, is particularly pertinent at this time when so large a percentage of the work being done is of an industrial character.

An Increased Differential—

Suggestions have been made along the line of an increased differential between the dealer and trade prices, as it is recognized that the contractor cannot do business on 10 per cent. However, our experience has shown that this would not be entirely satisfactory, as the differential soon becomes known and contractors have even been accused of splitting it to secure business; hence the final result of an increased differential might do more harm than good.

A Remedy—

Having had some experience with work of a character which involved both the question of price and classification, the writer has given the matter considerable thought and suggests the following as a possible remedy:

First, with regard to the classification: He believes that none except dealers, central stations, the U. S. Government, and manufacturers in whose product electrical material is incorporated are entitled to the best price.

Second: Only those buying materials in wholesale quantities and who of necessity regularly employ electricians for installation and maintenance should receive trade prices.

All others would then naturally fall into the third division—retail.

The Quantity Price—

As already suggested, however, any classification is bound to be unsatisfactory, or work injustice to some; but a revision of prices based on quantity

TABLE OF PRICES BASED ON QUANTITY SOLD

Miscellaneous Material	Broken Package	Package	Multiple Package
1. Conduit	Less than 500 (Suggested only)	500 — 5M.	5 M. — 10 M.
2. Wire	Less than coil	Full coil	5000' Lots and Over
3. Schedule Material	Less than Carton	Carton or Multiple	Std. Pkge. or Multiple
4. " "	Less than 1/5 Std. Pkge.	1/5 to Std.	Std. Pkge. or Over
5. Steel cabinets	Less than $25 List	$25 — $50 List	$50 or Over

purchased, applied in the same ratio to the entire trade, would be fair and entirely devoid of any legal entanglements or objections.

Electrical men are all familiar with the quantity divisions in the purchase of materials as given by the listings in the table shown above.

In every case the small quantity purchaser pays a higher price which is recognized as entirely proper and legal, but, who is your purchaser of small quantities? Not the contractor, only as he buys as a matter of convenience and because of the small penalty.

Now if we represent the published or trade price price in Package quantities as 100
The Broken Package price would then be represented by 115
The Multiple Package price by 90

This is approximately the present ratio and the contractor's cost in the same quantities would be 10% less.

Even under the most favorable conditions of purchase and resale the contractor now secures only 35—5—, the next best gives him 10—10, while the most frequent transactions give him 10 or 0. It is recognized by those who know that the contractor who is honest, maintains a place of business, carries a stock and buys in quantity sufficient to maintain satisfactory service, needs more than 10% or 10 & 10% margin in resale.

Increasing the Margin on Broken Packages—

The plan then is simply this,—increase the margin on broken package purchases as indicated below. For the purpose of comparison I show the present relative prices, also the retail price which should be established by the contractor dependent upon his selling expense.

	Broken Pkge.	Full Pkge.	Multiple Pkge.
Present Trade	115	100	90
Present Dealers	103.5	90	81
Suggested Trade	135	100	90
Suggested Dealers	121.5	90	81
Suggested Retail	150	135	

The penalty, to-wit, of 35% may seem large, but it is not too great and affords several advantages. Take the customer who is entitled to some price consideration but is not relatively a large consumer, he would pay 135 or 10% discount from retail; but the contractor buying, say, in full packages at 90 could afford to handle the business. Again, take "Time and Material" work.

Roughly if a job amounts to:

$1000— 60% of the materials are in broken packages
800— 70% " " " " "
600— 80% " " " " "
400— 90% " " " " "
200—100% " " " " "

A check of such a bill charged out at the new prices, say to the amount of $1000, would satisfy any reasonable customer as to its fairness even though he were accustomed to a much smaller overhead than the average contractor must allow for.

Advantages of Plan—

We claim for this plan several advantages.

First: This arrangement would make it possible for the contractor to go after the supply business and make a profit,—business we cannot in Oregon attempt to handle under present conditions.

Second: The jobber would benefit not only by securing a fair price for small quantities but his sales in standard packages would increase. Also many of the purchasers in small quantities such as small industrial concerns and office buildings now accustomed to installing their own work would come to the contractor for this work if assured of staple prices and satisfactory service.

Third: The evil attendant on the great multitude of instances where parties have been misquoted prices to which they were not entitled would largely disappear.

Fourth: This would also favorably react against the fly-by-night contractor, for in order to start in business a capital investment would be necessary.

Many other advantages possibly suggest themselves, and the more it is considered the better it appears. In fact, a careful study will reveal that the tendency to overstock is nil to the legitimate contractor. He will not increase his stock 5%.

Believing this is a consistent step in the right direction, the contractors of Portland and Oregon generally have given the plan their indorsement and it is now intended to launch the idea for a wider field of consideration with the hope that it will add one more round in the effort to make the electrical contracting business a respected and remunerative vocation.

SHOTS AT SUNDRY TARGETS

BY S. M. KENNEDY

(A few facts from actual experience which apply to retail stores as well as central station offices. Sage advice from the general agent of the Southern California Edison Company.—The Editor.)

THE OFFICE

Papers belong to the waste basket, not littered on the floor

S the company grows in size there is apparent in some directions a tendency to relax from certain standards which have previously been fixed. New employes come in to fill positions vacated by trained and efficient men, and these new employes are not always instructed as to what the company expects of them in their various positions. I have noticed that constant vigilance is required to keep district offices just as they should be kept. Now how should these offices be

kept? The Southern California Edison Company, for instance, has a total of 55 public offices in about as many different cities and towns. These are the rooms where we receive company—where we are on exhibition to our friends, customers and stockholders—for many of our customers are now and more will be stockholders. Are we always presentable? Are we always proud of our appearance, and if we are not, why not? Is it the fault of the company or the fault of the agent and his assistants?

Out in the Open—

At one time our offices were arranged with numerous partitions, peep holes and private rooms which carried about them an air of secrecy and standoffness. Now the office arrangements are entirely changed with a view to fresh air, freedom and frankness. This change invites inspection from all who enter, and inspection provokes criticism. Let us suppose you are a customer and a stockholder of the company. Let us suppose you go into the office to pay a bill, and while waiting your turn you let your eyes wander around. Let us suppose you are an observing but not necessarily a critical man, and that you should notice some of the conditions mentioned upon the following list, what would be your opinion of the company and its local management?

What would you think of the prosperity and enterprise of the concern whose offices contained desks littered with papers, pictures awry, gaudy calendars, and employees with their hats on? The same principle applies to the untidy central station office and the contractor-dealer's store filled with junk as holds in the slovenly home—you don't think much of the housekeeper—or the business man.

Suppose You Saw—

The glass in the windows carrying dust from the street traffic;

Flies or nasty fly paper in conspicuous places;

Floor not properly swept, especially near the corners;

Counters on which are writing pads of torn blotting paper and grimy ink wells;

Desks littered with all sorts of papers, books and records in a disorderly mess;

Scraps of paper all over the floor instead of in the waste baskets;

Office furniture spread around without any attempt at regularity or order;

Pictures hung askew on the walls;

Noisy looking calendars, advertising the local banker, butcher or baker, disfiguring otherwise attractive walls;

Cobwebs hanging about the electric light fixtures, and dusty deposits showing through the indirect lighting bowls;

Appliances on exhibition carelessly diplayed and conspicuously dusty and finger marked;

Employes smoking in office during business hours;

Employes behind the counter with their hats on;

Customers inspecting appliances and no one interested enough to explain their utility and quote prices.

One Man in Charge—

I have seen all of these objectionable conditions in various offices at various times, but certainly not all of them in any one office at one time. I know that as a customer and stockholder you would have a more comfortable feeling if tidiness and order prevailed in any office you might visit and if you were pleased with what you saw, either consciously or unconsciously you would carry away an impression which would be of value to the company at some future time. The company is spending much money in fitting up its district offices so that they may be attractive and business like. The maintenance of the office is up to the district agent and his assistants. If I were an agent I would appoint one man in the office as custodian and make him responsible for its upkeep in every detail. Then as agent if I saw anything that needed attention I would point it out to the custodian and ask him why.

Wasted Energy—

This company is primarily a hydro-electric company, but for some time past all the hydro-electric energy is sold before it is generated and a large proportion of the load is carried by the steam plants. We have no water power running to waste at any hour of the day or any day of the year. On the other hand, as I go around, I notice much energy being wasted in the District Offices, unnecessary lights burning in the daytime, and too many lights burning after eleven o'clock at night; fans running after hours in the summer time, when they do no one any good, and heaters warming unoccupied rooms in the winter time to no one's advantage. Figure up the kilowatt hours wasted in this way in your office, then multiply the number by the cost of energy delivered in your district upon a steam basis and you may find it amounts to a considerable sum during the year. It is safe to say that in the local offices there are many thousands of kilowatt hours dissipated each month. The company does not desire to restrict the use of energy in its offices or other buildings, but there is a decided objection to waste.

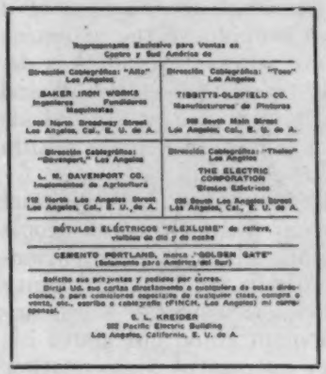
General Satisfaction—

In our organization the appearance of an office does not make a district, but it does help to mark it. Show me the district office that is well kept and I will show you an office that probably pleases the Auditor because the reports are in promptly; satisfies the Treasurer because the collections are good; is commended by the General Storekeeper, the General Superintendent and the General Agent because they get what they want when they want it.

Western Ideas

(Practical suggestions and selling hints from the West which have been tried out in actual practice—The Editor.)

A FOREIGN BUSINESS CARD, which is necessary for any business man having business relationships with a foreign country is not the mere name and company familiar through common use, but contains most of the information important to prospective buyers. An idea of what such a compilation looks like and what type of information is included thereon is shown by the accompanying reproduction of the back side of the card of J. W. Finch, manufacturers' representative, designed for use in South America. The card is of the ordinary business size but double, being folded back upon itself. The interior of the little booklet thus formed contains the information as to the companies represented, cable address and other pertinent information here given. The effect of the whole is neat and attractive and suggests that the bits of pasteboard in general circulation in this country might be put to much more effective use than at present.


Representante Exclusivo para Ventas en Centro y Sud América de

Dirección Cablegráfica: "Alto" Los Angeles
BAKER IRON WORKS
Ingenieros Fundidores Maquinistas
320 North Broadway Street
Los Angeles, Cal., E. U. de A.

Dirección Cablegráfica: "Toro" Los Angeles
TIBBITTS-OLDFIELD CO.
Manufacturers de Pinturas
340 South Main Street
Los Angeles, Cal., E. U. de A.

Dirección Cablegráfica: "Davenport," Los Angeles
L. M. DAVENPORT CO.
Implementos de Agricultura
710 North Los Angeles Street
Los Angeles, Cal., E. U. de A.

Dirección Cablegráfica: "Thelco" Los Angeles
THE ELECTRIC CORPORATION
Ventas Eléctricas
226 South Los Angeles Street
Los Angeles, Cal., E. U. de A.

RÓTULOS ELÉCTRICOS "FLEXLUME" de relieve, visibles de día y de noche

CEMENTO PORTLAND, marca "GOLDEN GATE" (Solamente para América del Sur)

Solicite sus proyectos y pedidos por correo.
Dirija Ud. sus cartas directamente a cualquiera de estas direcciones, o para comisiones especiales de cualquier clase, consulte o visite, etc., escriba o cablegrafie (FINCH, Los Angeles) mi corresponsal.

S. L. KREIDER
322 Pacific Electric Building
Los Angeles, California, E. U. de A.

An effective business card

A SAFETY ARGUMENT is one of the best sales builders in obtaining orders for industrial lighting. A recent issue of the Safety News, issued by the Industrial Accident Commission of California, suggests rules for the adequate lighting of factories and workrooms—as well as giving charts of accident statistics. In quoting from an investigation by Fred Schwarze on Shop Lighting the question of drop lights is discussed:

"In planning an installation for a department a careful study should first be made of all conditions. First the location of individual lights for illuminating particular machines or working planes should be determined. Wherever possible this should be accomplished by the use of overhead units which will contribute to the general illumination because the ordinary drop light does not add materially to the same. These lights should be so located as to avoid shadows. The general illumination from the lights over individual machines should be considered in laying out the installation of additional units for the general lighting of the department. It is important to so arrange these light units that the intensity of illumination will be greatest at the points where actual work is being done. In accomplishing this, care should be taken to avoid shadows made by workmen's bodies, tools and other objects. In buildings where there are columns or posts the light units should be so arranged as to practically eliminate shadows from same. In carrying out this plan it will be found that the units can not always be arranged regularly over the room but must be so located as to distribute the light to the best advantage to all parts of the room. Individual drop lights should be avoided as far as possible. The general lighting units should be so arranged as to give local illumination. This will largely eliminate drop lights.

A WINDOW CLUB is a suggestion which comes from the East as an idea for the West. With the Westchester Lighting Company, Mt. Vernon, N. Y., all window-trimming problems are decided by a club consisting of the thirty men in the main sales room and the seven branches who are particularly interested in window trimming.

Every month the manager, salesmen, and advertising men of the club get together and talk over the plans for the coming month. Many valuable lessons are drawn from the "post mortems" that are held on some of the windows which haven't quite come up to expectations. Company officials liven up the meetings, and, once in a while, outside specialists in display are called upon to touch on new angles of display salesmanship.

At each meeting two subjects are decided upon for the following month, and each branch is expected to install both trims. Of course, additional trims can be put in, if the branch wants them, as is often the case. The result is that they average about three trims a month for each window.

General subjects are selected wherever possible. Some of those worked out last year were Washington's Birthday, Easter, Thanksgiving, "wire-your-home," food preservation and home lighting.

Every effort is made to tie up the windows with sales plans. The Club of course are familiar with the general sales policy and select the window display subjects accordingly. If for any reason it is

THE PROPER USE OF DROP LIGHTS

When drop lights are used their height should be carefully calculated. The picture gives two views of a workbench. On the left the electric light throws a glare into the workman's eyes. In the other view the reflector used eliminates all glare from the operator's face and concentrates the light rays directly upon the work. By this means a source of eyestrain has been removed.

decided to push certain articles after the monthly meetings, each branch is informed and is expected to put in special windows featuring these particular goods.

There are five points that are considered essential in every good window display: General artistic appearance, selling power, attractive decorative features, appropriate background, and originality. In order to secure these in each of the displays, prizes are awarded to the best displays of the month. A photograph is taken of each display and sent to a committee of officials. This committee studies each photograph and gives it a rating on each of these five points, as for example—appearance, 5; selling power, 3; decorative features, 3; background, 1; originality, 5; or a total of 17. The three displays having the highest ratings are awarded prizes of $12, $8, $5, respectively.

Actual work of trimming the windows is usually done by the outside salesman of each branch. He is responsible for appliance sales and therefore he is directly interested in the selling power of each window.

Manufacturers' display material is used for decorative features and backgrounds. It is generally much better than anything which can be prepared locally, and it also helps to tie up local advertising with the manufacturer's national publicity.

Show cards giving prices, special combination offers and important selling points are especially valuable. At the main office a stencil machine turns out excellent show cards rapidly, and each of the branches sends in its orders for the cards it will use during the coming month. When more cards are wanted than the machine can turn out, part of the work is given to local card writers.

Last year, however, the Christmas window contained a number of different pieces of apparatus and after Christmas the chief clerk in charge reported that he had been compelled to requisition $150 worth of articles to replace those sold out of the window.

TESTING OUT WINDOW DISPLAYS by counting the number of people influenced by a particular window convinced one western dealer of the value of tying up with national advertising.

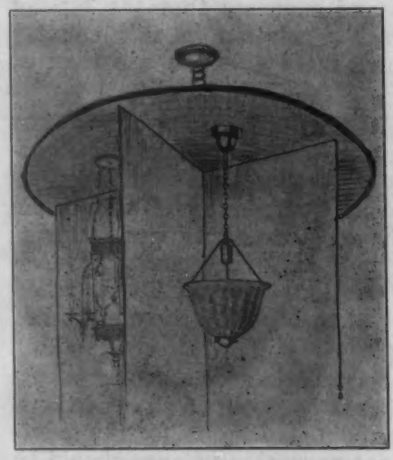
A company on the Pacific Coast conducted a series of experiments to test the pulling power of window trims. In its store in the best retail district, the window trim was changed every three days and a careful count was made of the number of people who passed the window, the number who stopped to look, the number who entered the store, and the number who actually made purchases.

The test proved to this company that the windows which attracted most attention and brought the most people into the store were those that linked up directly with national advertising, featuring washing machines at a time when these were being pushed, running a window on irons during electric iron week. A full page magazine advertisement paid for by the manufacturer was found to pay if the dealer connected it up with his store. A window display which showed a reproduction of the advertisement or was timed to be coincident with feature campaigns was found to have the same effect as the line "sold at ....." beneath the advertisement itself.

THE VANITY PRICE, according to one of the manufacturers in a different line, is an extra price which can easily be obtained on articles appealing particularly to the artistic sense of men and women. It may be some new and distinctive coffee urn displayed attractively, in the case of a woman, or a novelty flash light or desk lamp, in the case of a man. Such articles, when brought to the attention of certain customers almost always stimulate a desire to possess the article before others get it, and the persons for whom novelty possesses a great attraction are willing to pay almost any price within the bounds of reason for the goods.

Every electrical store has patrons of this sort and the wise retail salesman will have these people in mind and make it a point to bring to their attention novelty items that can be sold for a "vanity price." It is one of the knacks of retail salesmanship which makes one saleman stand out above his fellows and one store very successful while another yields only a fair living to its proprietor.

A VERY CLEVER DEVICE of his own invention for showing fixtures is being used by J. M. Nightingale in his new store in Modesto, according to H. B. Brainerd, Northern California field representative of the California Electrical Cooperative Campaign. This consists of a round turn-table about four feet in diameter, constructed of a wooden frame



A turntable for the display of electric fixtures which provides a good background as well as a means of showing fixtures singly.

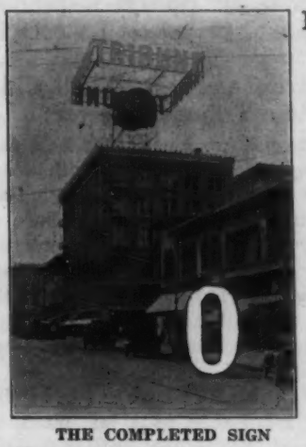
work faced with beaver board, suspended from the ceiling. It is quartered by strips of black cloth hanging from it. In each segment Mr. Nightingale suspends one of his better fixtures.

As this turn-table will revolve, bringing into view one fixture at a time, it is possible for him to concentrate his customer's attention and assist him in making a selection. Showing the fixture against the black background also assists in bringing out the beauties of it.

Mr. Nightingale has four fixture rooms showing the various rooms of the home. In each of his rooms he shows the fixtures particularly adapted to it. In these rooms a number of turn-tables are used. The turn-tables are constructed in his own store at a very slight cost.

A PROBLEM IN SIGN INSTALLATION

(The solution of several new problems in the electrical installation and the erection of a large electric sign in Oakland, California. An accomplishment which points the way to new opportunities for the wide awake contractor.—The Editor)



THE COMPLETED SIGN
The wires in the foreground are not guys—but trolley wires

ONE of the most striking land marks on the Pacific Coast is the new electric roof sign and electric clock just completed by the Novelty Electric Sign Company on the roof of the new Tribune Newspaper Building, in Oakland. The sign is in the form of a steel tower and, as the photograph indicates, is larger at the top than in the central upright portion.

The newspaper management put the problem up to the Novelty Electric Sign Company, to submit the most striking idea possible for a spectacular roof display. The idea of a large four-faced electric clock was suggested, lighting the numerals, as well as the hands, by exposed electric lamps, instead of the conventional glass transparent clocks, such as the San Francisco Ferry tower. In connection with this, the letters TRIBUNE were to be used, likewise electrically lighted.

The original idea was for the clock to surmount the name, but the newspaper people insisted that the name TRIBUNE be made the particular feature and the clock incidental. The problem thus became an engineering matter. The diameter of each face of the clock was to be 15 feet; the letters TRIBUNE to be 11 feet high, and it was found that the seven letters composing the name could be squeezed into no smaller space than 50 feet, still making a legible attractive electric sign.

Problem:—Could a fifty-foot square be superimposed on a 15-foot square tower on the roof of a six-story building, the sign to be approximately 30 feet above the roof?

The Novelty Electric Sign Company called on their consulting engineer, Mr. A. G. Brunnier, as to the practicability from a safe engineering standpoint of this problem. The plan as worked out and submitted, was declared feasible and the order to go ahead was given.

It was found that the supporting columns of the roof at this point were irregular, and a cantilever method of foundation had to be constructed. It was decided to make the central portion of the tower 17 feet square, arranging for the main bearing strains and supports to fall on the upright columns which extended from the floor below, either directly or by the cantilever method of construction. Concrete foundations 3½ feet high and 26 inches thick had to be constructed, so arranged that the upright supporting angles of the structure were firmly embedded and fastened and the entire weight brought directly down to the upright columns.

There was another problem facing the Novelty Electric Sign Company, in constructing the sign, and that was the matter of securing steadiness for the clock mechanism in the tower. This was accomplished by using heavy channel steel beams and putting in a very firm foundation, midway of the height of the tower. The entire sign contains approximately 25,000 pounds of steel. There is a projection of 16½ feet from each end at the top of the 17-foot square upright central tower, supporting the letters TRIBUNE. This is built in the form of a truss, in exactly the manner used in bridge construction. The work was nicely calculated to secure the biggest amount of resistance against wind strains, cutting down on the use of very heavy steel at any single point, but placing a greater number of lighter steel

THE SIGN AT NIGHT
The striking effect of the illuminated sign—which can be seen for miles around

members to form a series of trusses, thus yielding stronger stiffening resistance.

Referring to the electric time clock, the diameter of the clock, as above mentioned, is 15 feet; the height of each numeral 26 inches; the hour or smaller hand is 6 feet, three inches long and weighs approximately 35 pounds. The minute or larger hand is 9 feet, 2 inches long and weighs slightly more than 50 pounds. The hands are made from aluminum and have the sockets in a channel with a reflector strip holding the light. The hands are balanced and counter-weighed with lead so that when the same are mounted, the slightest pressure with the little finger might turn the hand in either direction, when disconnected from the dial gear machines.

On a platform in the tower is placed what is known as a secondary tower movement. This mechanism is electrically controlled and operates four shafts which turn the dial gears once each minute.

These dial gears are located back of each set of hands on each of the four clock faces. The tower movement receives its impulse once each minute from the master clock which is located in the main business office, seven stories below, in the newspaper building.

There are, of course, the necessary battery charging starting and controlling devices for the operating of this mechanism. There is likewise an attachment which is thrown on the sign at dusk and switches it out at midnight. There are collector

THE SIGN AND NECESSARY FRAMEWORK

The letters are 11 ft. high and the length of one side of the upper square is 50 ft., surmounting a clock of 15 ft. diamenter. The whole is light but well reinforced steel construction.

rings with brushes on each of the shafts which keep the current continuously operating to light the hands at night. There is a total of approximately 21000 feet or four miles of electric wire used in this sign, and there is a metal house, seven feet square, located in the clock tower back of the dials, which houses the electric equipment controlling the various devices and electric terminals for the sign.

In the upper portion of the structure, back of the letters TRIBUNE, are lamp platforms, equipped with steel safety rails for use by electricians in lamping and relamping of the sign. There are two sets of these platforms, one placed above the other, at the distance of approximately five feet. On a line with the tops of the letters, at each of the four corners of the sign structure, is placed a G. E. Standard Floodlight Projector, trained toward the center of the sign and at night illuminating a large flag, flying from a 25 foot flag pole which surmounts the entire structure.

This electric sign and clock faces the points of the compass and is visible for miles around. It is a land mark which distinguishes and brings out distinctly the Oakland Tribune Newspaper Building, and has become a never-ending topic of conversation among the residents of the East Bay Cities.

Because it was a new departure to rear a great steel clock tower and electric sign on the roof of a tall city building, the erection of the new sign was subject to the closest scrutiny by the Oakland Building Department, Electrical Department, and the California Industrial Accident Commission. The details were likewise submitted and passed upon by the experts of the Board of Fire Underwriters of the Pacific.

During the erection of the tower, electric sign and clock the work was under careful inspection, and was again inspected and tested on its completion.

Speaking of the electrical work, B. C. Hill, Chief electrical inspector said to a Tribune reporter:

"The plans submitted to me are among the best that have ever passed through my office. The care with which the installation is being made makes my work easy, but I am not passing up any details on that account. I have been on the building almost every day while this work has been under way. It is being put up in accordance with the plans and specifications, which are as near perfect as any plans of the kind I have ever had to pass upon. When it is complete, my men will give it a thorough inspection as to every detail before they give their final approval.

This is the first tower of the kind we have had to handle, and we are giving the work more than usual attention, as it is of more than usual interest.

It is this sort of electrical work that makes the modern metropolis so beautiful and picturesque by night."

IF I WERE A POWER SOLICITOR

BY C. E. INGALLS

(Selling service as a new type of salesmanship—one of a series of talks which has enlivened the luncheons of the San Francisco Development League. The Author, who is connected with the Crocker-Wheeler Company, San Francisco, is well qualified to speak on good selling methods.—The Editor.)

The title of solicitor is ordinarily applied to one who merely asks for an order, and displays no particular skill in securing it. To sell power requires skill, and if I was employed as a so-called power solicitor, the first thing I would do would be to secure a new title. I would want to be known either as a power salesman or as a power engineer.

If I should suddenly find myself a power salesman, I would have to completely revise my point of view. I am used to dealing with material things; with something that can be seen, and whose construction can be explained. A power salesman must sell power, which cannot be seen, and whose construction cannot be explained. I could not explain that my power had more kilowatts per kva than my competitors', or that the the amperes and volts of my power were of a superior kind. While other salesmen sell their devices and their service, it is necessary to sell power largely from a basis of service. I would sell the service of my company, and to that end I would familiarize myself with all the good points of my company's service, and would constantly endeavor to impress my customers and prospective customers with the value of this service. I would become familiar with my company's power plants, distributing systems, and with all the equipment and precautions provided to give a thoroughly satisfactory power service.

One of the most convincing proofs of the value of my company's service would be my own demonstrated ability to render to my customers real service. To fit myself to give the best service to my cus-

tomers, I would become familiar with the basic principles of electrical engineering. I would want to understand the main principles of rate making, and to become familiar with the company's rates and the application of the various rates. I would want to understand the construction of various classes of electrical apparatus used by my customers, and would want to be thoroughly familiar with the correct use of that apparatus. Also, I would want to understand the most approved systems for installing that apparatus.

I would consider it my duty to cause old customers to more thoroughly understand and appreciate the valuable service being rendered them by my company. It would also be my duty to convert to the use of my electrical power those securing their power through other sources, such as steam and gas engines.

Also, I would be persistent in my efforts to secure power contracts with firms about to start to use power in my territory.

In addition to these necessary and essential duties, I would do more constructive work. For example, I would find for my customers additional ways to use power, as I would know that my company could supply this increase in power to an old customer more cheaply than it could this same amount of power to a new customer.

I would, so far as my duties would permit, keep in touch with public movements.

I would be active in organizations that promote the welfare of the electrical industry, and would work in conjunction with the Chamber of Commerce, or any organization devoted to bringing new industries to my locality.

In my work, I would constantly watch for some fact that would be of interest to the newspapers, and that the newspapers would use as a news item, this item to make mention of my company, its service, or its employes. I have seen such newspaper items result in much valuable power company publicity, and I would consider this an important part of my duty.

Wherever possible, I would counsel my customers regarding the various phases of their electrical needs, for I would know that they would be most pleased with my company's power service if their electrical needs were all properly cared for. To this end, I would endeavor to counsel them in such a way as to be sure that they would buy proper high-class equipment, and would have this equipment properly and carefully installed.

Some salesmen of power apparatus and some contractors are active, energetic, and reliable, and are working hard to sell high-class apparatus, and have it properly installed. I would keep in touch with these men, knowing that they could render me a service, just as I could be of service to them.

I would, as a power salesman, be diligent in the serious study of new developments in the electrical industry, having always in mind the advancing of the best interests of my company.

TAKING ADVANTAGE OF FOREIGN OPPORTUNITIES

A Letter to the Editor

I have read with a great deal of interest the issue of June 15th of the Journal of Electricity with reference to foreign engineering and commercial activities.

We are of the opinion that there is no better way for this country to obtain a commercial foothold in any of the foreign countries than through engineering endeavor.

If American engineers are retained to develop certain resources of some foreign country, it is but natural that any developments that take place under their direction will, insofar as possible, utilize American-made equipment; hence an opportunity for export. If these engineers are further retained to operate the resultant plant and development, in a certain measure the products of this plant will be under their control; and if they are needed in our country, it is very likely that this will result in the importation of certain needed products.

Germany has done this for years and as a result gained a foothold in many countries of the world, and even in our own, simply by utilizing scientific talent to keep posted on what other countries were doing, and in a measure in such way controlling the market of the specific or particular plant where German talent was used.

Wherever possible, these resources should also be developed with American money; and inasmuch as in several of the Pacific countries some of our largest banks have branches, they should by all means encourage such developments with their funds and under the direction of competent American engineers. If this is not possible, they should encourage their clients to develop under the direction of American engineers, pointing, as they can with pride, to achievements in this country of a similar nature.

In addition to this, our Consular Service ought to have in every country of importance a scientific and commercial attache to promote the above mentioned object.

The result from such endeavor, as has already been proven by Germany, will be a far stronger tie and commercial and political hold upon the country handled in the above described manner.

We know of a small neutral country that, from the proceeds of profits in what is known as "war babies," has developed a controlling company that now owns established engineering and business houses in every principal city on the North and South American continents. They bought out well-established houses, these houses continuing under their old firm names, the parent company not appearing in any way whatsoever, except in controlling the policies of all the branch houses. They endeavor to be in close touch personally with the people in each locality and to furnish them with any kind of information to purchase any kind of apparatus, always doing business in the language spoken in these countries and using the weights, measures and money standards prevailing in these countries. For instance, one of their offices in South America has a client that is desirous of selling a certain product and for some reason cannot locate the best market for this product. This branch office will then immediately post all the other branch offices throughout the two continents on what this man has to sell and in ninety-nine cases out of one hundred they sell the product and turn over the entire profits, outside of the expenses directly attached to the sale of the same, to the client; and in that way get this man's good will and boosting efforts for probably the rest of his life, resulting in many instances in big and profitable business, all of it with a view of promoting the sale and utilization of this neutral country's products and talent.

H. E. LINDEN,
Vice President, Beckman & Linden Engineering Corporation.

Technical Hints

BY GEORGE A. SCHNEIDER

(Practical working information essential to the contractor-dealer who may be called upon to handle pumping installations. Particular application in the West, where electrical irrigation forms a large part of the summer load. The first of a series of articles. —The Editor)

CENTRIFUGAL PUMPS—THEIR SELECTION, INSTALLATION AND CARE

During the past five years many excellent articles on the subject of centrifugal pumps and their installation have appeared in the Journal of Electricity. However, none of these articles seem to have been especially written for the electrical contractor-dealer and his staff.

The Practical Installation

Electric motors, except in special cases, afford the most satisfactory form of power for driving pumps of all classes. Accordingly, a very large portion of all pumps sold, whether of the centrifugal or other types, are motor driven. The subject is therefore of vital interest to the electrical contractor-dealer and the electrical fraternity in general.

In many instances the contractor handles the complete plant, furnishing all the appparatus and appurtenances and completing the installation with the exception of that portion which is taken care of by the central station supplying the service. In other instances, the contractor may only furnish and install the electrical part of the equipment. Again, his part may include only wiring for and installing the motor and control apparatus which is furnished by another contractor or the customer. In any case, to intelligently handle such contracts, the contractor and his electrical men should have a practical working knowledge of pumps and their characteristics.

This article and several others to follow will deal only with centrifugal pumps. An effort will be made to make the articles of special value to the electrical contractor-dealer. The articles will include a discussion of the characteristis of these pumps, method of determining the total head method of determining proper speed of pumps and motors, the best size of pulleys for belt-driven outfits, the types of motors best adapted to centrifugal pumps, some notes on control and protective devices for pumping plants and several other similar subjects which are quite commonly brought up in connection with pump installations.

Sources of Information

Theoretically considered, the centrifugal pump is not a simple device. The formulas used in its design by skilled designers are indeed very complex and are further complicated by many variable constants which enter into the calculations. For practical purposes, these complicated formulas can be replaced by relatively simple tables which show the relation between speed, capacity, head and other factors which must be considered when making pump installations. Tables of this kind are supplied by the various pump manufacturers in catalogs or other publications describing their products.

The subject of centrifugal pumps in general has been quite thoroughly treated in the trade journals and in various handbooks and textbooks from a technical standpoint. However, it is hoped that the method of handling the subject will appeal to those of our readers, including the electrical contractor-dealer and his workmen, who may not be thoroughly conversant with this type of pump.

Principle of Operation

A centrifugal pump consists essentially of a casing within which revolves a fan shaped impeller or runner mounted on a shaft and carried by suitable bearings. When operating the water from the suction pipe enters the impeller at its center in an axial direction and passes between its vanes outward into the surrounding casing and thence into the discharge pipe. The inner edge of the impeller vanes or blades takes the water flowing at the low velocity of the suction intake and gently starts it revolving, increasing or accelerating its velocity as it flows outward until the velocity at the outer end of the blades reaches a maximum, and at this point, due to the centrifugal force, it has acquired a pressure which is dependent upon the revolutions of the impeller, form of blades, an area between them.

The speed or velocity with which the liquid leaves the impeller also depends upon the revolutions of the impeller and the form of its vanes and their area. It is the function of the casing within which the impeller revolves to gradually reduce this high velocity to the low velocity of the discharge pipe. As the velocity is decreased it is changed into pressure. The theoretical head or pressure against which the pump can deliver is therefore represented by the pressure in the water as it leaves the impeller plus the additional pressure due to converting the velocity energy of the water leaving the impeller into the pressure energy.

In practice the proportion of the theoretical head realized, therefore the efficiency of the pump, will depend entirely upon the knowledge and experience of the designer, upon how closely the pump when built follows the design and the workmanship and finish of the parts through which the water passes. As already stated, from the designer's point of view the centrifugal pump is rather complex and it requires considerable experience to produce pumps in which the three variable factors—speed, capacity and head—are correct for a given duty and at the same time obtain maximum efficiency. The problem is to obtain the greatest output of liquid pumped with the least amount of power input.

Advantages of Centrifugal Pumps

In its construction the centrifugal pump is extremely simple. In fact due to this feature it has a particular field of use in which it cannot be replaced by any other type of pump. There are no valves and no reciprocating parts or rubbing surfaces other than the bearings; theregore, no parts to get out of order which makes them simpler and easier to take care of than other types of pumps of more complicated construction. They work without shocks, pulsations or vibrations in the piping and the discharge

is steady and uniform. They may be started or stopped without noise and are practically silent in operation.

The operating characteristics of centrifugal pumps are such that in case of obstruction or complete stoppage of delivery, the pressure cannot increase beyond a certain predetermined value. This means also that it is possible to completely close the valve in the discharge pipe without injury to the pump or driving mechanism. This is an important characteristic and is not found in any other type of pump, although it is possible to equip other types of pumps with certain forms of relief valves. Centrifugal pumps will handle hot or cold liquids, or those carrying a high percentage of solid matter such as paper pulp, mud or rock, silt, slimes, brewers mash and the like. A further very important advantage is that this type of pump is especially well suited for motor drive. The motion is wholly rotary and the operating speeds usually high, permitting direct and economical connection to electric motors wound for standard commercial speeds.

These advantages in favor of the centrifugal pump are to a certain extent offset by the lower operating efficiency as compared with the plunger pump and further by the fact that centrifugal pumps are likely to give more trouble at starting. Reciprocating pumps, assuming that packing is good, will usually start without priming. The centrifugal pump must be primed and the priming will be discussed more in detail in another article.

Classification of Centrifugal Pumps

Centrifugal pumps may be classified according to the number of propellers as single-stage and multi-stage pumps, and according to the form of construction as volute and turbine pumps. A single-stage pump is one having only one impeller; a multi-stage pump is one in which two or more impellers are mounted on the same shaft within a casing so constructed that the water passes from one impeller into the other, each propeller equally raising the pressure. In this case the pumps are working in series. It is also possible to work two or more pumps in parallel. Further, the impellers do not necessarily need to be in the same casing. It is possible to connect individual pumps in this manner. Thus, two single-stage pumps, each capable of delivering 1000 gallons under 100 foot head, connected in series, will deliver 1000 gallons at 200 foot head. The same pumps connected in parallel would deliver 2000 gallons at 100 foot head, thereby making a very flexible arrangement for certain classes of service. Here it should be noted that a centrifugal pump never loses any head that may be received by it at the suction flange. Thus, if a pump capable of delivering water at 100 foot head receives it at 50 foot head it will discharge the water under 150 foot head if driven at its normal speed for 100 foot head.

Volute and Turbine Forms

In the volute pump the velocity energy of the water when leaving the propeller blades is converted into pressure energy by the gradually increasing size of the chamber in the casing. This pump derives its name from the peculiar form of the pump casing.

Turbine pumps were originally so called because they were fitted with diffusers or guide vanes outside of the impellers and thus resembled turbine water wheeles. In this type of pump, the liquid after leaving the impeller blades, must pass through the diffusion vanes, the function of which is to gradually convert the velocity energy of the water into pressure energy.

These pumps may be further classified as horizontal or verticle, depending on the position of the pump shaft. The horizontal pump is the simplest in construction. It requires no special forms of bearings to support vertical revolving parts and all parts are readily accessible. Again the method of drive is simpler than the vertical type and it can be easily adapted for belt or direct connection.

Horizontal pumps may be still further classified as single or double suction. In the former, the water is received at one side of the pump, due to this fact there is a tendency of the pump impeller to crowd or move towards one side, so in single-suction pumps provision must be made to balance this end thrust by means of special bearing construction or equivalent means.

The Double Suction Pump

The double-suction pump receives half of the water on each side of the impeller. Theoretically there is equal pressure on each side of the impeller and therefore no tendency towards unbalance as in the single-suction pump. Therefore, no special provision for end thrust is ordinarily provided. However, to secure perfect balance and thus eliminate end thrust it is necessary that the pump be very carefully constructed and in the higher grade pumps a test for complete hydraulic balance is given before shipment. This point is mentioned because so frequently it is overlooked, whereas in actual practice much trouble arises due to end thrust in this class of pump. Methods of taking care of end thrust are described in the pump manufacturer's catalogs so will not be discussed here in detail.

Double-suction construction is used because it permits a small diameter of pump impeller and corresponding high operating speeds which are very desirable or necessary under certain conditions or with certain class of drive. As pointed out in an earlier paragraph, the pumping or total head is a function of the peripheral speed of the pump impeller. In the double suction pump the impeller can be made much smaller in diameter than in the single-suction pump of the same capacity. For a given head the pump speed may be accordingly increased. This is very advantageous for large pumps operating under low lift where the speed with single-suction would be very low.

Vertical pumps can be built with water inlets either at top or bottom of the casing. The pumps may be submerged or may operate with suction lift. The submerged pump is always primed and therefore can be used to good advantage in isolated places without danger of losing priming.

DEVELOPMENTS IN THE USE OF STORAGE BATTERIES

BY G. F. WAKEMAN

(How the storage battery works—its development and increasing use with modern conditions. An essential factor in many summer uses of electricity and a growing central station load. Some of the present applications and the future possibilities. The author, who is connected with the Edison Storage Battery Supply Company, is well known as a specialist in this field.—The Editor)

The Invention

In 1860 M. Gaston Plante constructed the first practical secondary battery utilizing two sheets of lead 60 cms. long, and 20 cms. wide, and 1 mm. thick, insulated and immersed in diluted sulphuric acid, 1.070 specific gravity.

On sending a current through the plates the electrolyte was decomposed and hydrogen and oxygen thrown off. The hydrogen was given off at one pole, thus producing a very bright surface of pure lead. The oxygen which was given off at the other pole produced a plate of lead peroxide. After discharging which continued until the plates had resumed their normal condition the connections were changed and the cell recharged. By several such cycles the capacity of the cell was found materially increased. Thus the development of the practical lead storage battery of today had its inception.

Plante found that the completed cell gave 7.25 ampere hours per pound of lead, a result which was not exceeded by later developments, of this type of plate.

Later the formation of Plante's types of plates was accelerated by a sort of pickling processes in nitric acid, by allowing the plates to remain in this solution from 24 to 48 hours. From this period innumerable changes have been made as to method of forming up lead plates for storage batteries.

Improvements in Design

About the year 1881 Faure produced an accumulator with a plate composed of a grid containing pasted material. Various forms of material such as alloy of lead and antimony packed with lead peroxide have been used for the paste in this type of plate with various improvements in the lead battery of today.

While storage batteries were used from the year 1860 and development was quite rapid we do not find them used in practical transportation until the year 1880 during which time at the Paris Exposition two storage battery cars were put into practical application with a fair degree of success. In 1883 another car was put into operation, at Kew Bridge, London. This car was equipped with 50 cells at a weight of 4000 lbs. and carried 50 passengers attaining a speed of about 6 miles per hour on level track.

Practical Uses

Later storage battery cars were tried in Antwerp, London, Paris and Brussels and did much toward promoting the use of storage batteries.

In central station work we find storage batteries quite generally used in the year 1895. Out of the 189 central stations in Switzerland 87 contained storage batteries. In 1897 out of 77 per cent of the central stations employing direct current 80 per cent of these used accumulators. Of 36 central stations belonging to the Association of Representatives of German Electric Supply Undertakings representing Norway, Sweden, Denmark, Germany and Austria, 25 used accumulators ranging in power from 65 to 1746 kw. hours.

The first example of batteries being used in rail-

ONE OF THE MODERN APPLICATIONS OF THE STORAGE BATTERY

A western scene showing the extensive use of storage battery trucks for delivery service. The war has increased the use of this commercial type of vehicle, as shown by statistics from abroad

way power stations was in the power plant of the Zurich-Hirslanden Railway in Switzerland. This installation consisted of 270 cells connected in parallel with the generator.

In our own country we find the Boston Edison Company had three battery plants in operation ranging in capacities from 3000 ampere hours to 8250 ampere hours. In 1898 the Philadelphia Edison Co. had the largest storage battery plant in the world, consisting of 160 cells with an ampere hour capacity of 15200 at a 10-hour rate.

Storage Battery Passenger Cars

During this period of time, several experimental storage battery propelled passengers cars were built in this country and at last in the summer of 1904 a car was put in regular service in the yards of the great network of railroad tracks along the Chicago river and this same car was still in service in 1912 holding a franchise for the road on whose track it was running. This car paved the way toward greater activities along this line, and during 1910, 1911 and 1912 lines in New York City were established, using the single truck type of car with 110 volt batteries.

In 1911 and 1912 The Pennsylvania and Erie Railroads both installed cars of the double truck type and these cars with slight improvements proved the salvation of many of the short line runs where there was not traffic enough to warrant steam, trolley or third rail equipment and gradually many of these cars were installed all over the country.

The development of the double truck storage battery car was rapid and it was followed by a demand for these cars in train units of two, three and four cars, equipped with the multiple unit control, the first unit being tried out on the Pennsylvania Railroad tracks with very good success, and shipped to Havana, Cuba, where it is still operating.

Development of Commercial Vehicles

In 1904-05 active development of the storage battery electric pleasure and commercial street vehicles saw great advances in this country, and on December 21, 1911, at a single stroke the firm of Gimbel Bros., New York, placed on the streets of New York City 96 storage battery trucks, which was the largest fleet of this type of equipment ever put in service by a single concern at one time.

The Adams Express Company are the largest users of electric commercial street vehicles of any single concern in the entire world, operating several hundred trucks, but it is not unusual for some of the larger eastern firms to have as high as one-, two- and three hundred storage battery operated electric trucks, although they may be in service in different cities as is the case with the Adams Company. Abroad the conditions are very much the same, and this is particularly true in Great Britain, where there are many large fleets. This industry has not suffered to any great extent on account of the war and as a matter of fact, the war has stimulated rather than retarded the sales of electric commercial vehicles across the waters.

Statistics show that electric storage battery commercial trucks hauled over the streets of our cities in this country in 1917 more than 20,000,000 tons of commodities, used more than 27,000,000 kw.hr. for recharging batteries and traveled more than 18,000,000 miles.

In the West

It might be interesting to some of you to learn that there are about 100 storage battery trucks, including street and industrial types, operating in the one city of San Francisco. These are charged every day, consuming 2500 kw.h. daily or 750,000 kw.h. annually.

Storage batteries are as you all know used extensively in all kinds of mine haulage, in fact almost exclusively in many of the gaseous mines where the deadly trolleys have caused more deaths than all of the fatalities by electrical accidents put together on top of the ground, and it is in these conditions that the storage battery has been, and is, an ever welcome guest.

In the War Zone

Do you know that storage batteries are hauling on a conservative estimate no less than 50,000 tons of ammunition and supplies each day, over there, by means of little industrial storage battery tractors and rail locomotives. Why? Because they are quiet, no trouble to get them started and the easiest maintained machine for this work that is obtainable. Reliability is their middle name and with a switch of batteries when one set is discharged, the machine can go out and do another full day's work. Factories are using them, as are steamship companies, railroads, warehouses and every conceivable institution where the highest efficiency is expected and exacted.

As there is only one country which seems to be doing very much with submarines, no mention will be made of this subject, except to state that storage batteries for submarines have been developed to a very high point of efficiency since the year 1913, and it is a well established fact that, with the present batteries, it is possible for this type of craft to travel several thousands of miles from their base of operations with no fear that the batteries will need attention before they return to their base. We have had this fact very forcibly brought home to us by the recent invasion of eastern waters by our common enemy.

In the Ship Building Campaign

As we all know, storage batteries have been developed for a great number of different services, such as auto lighting, self starting, gas engine ignition, marine lighting, and auxiliary ship lighting and wireless, and as is well known, since the year 1914 conservative figures show more than 1400 ships sending out their last appeals for aid after fires were out. In these instances, the saving of more than 33,000 souls can be directly traced to these last S.O.S. calls made by the storage battery auxiliary wireless installations.

Today the storage battery has been put on a plane where its uses are too numerous to mention. Unknown to many, no doubt, it has developed to a point where the cost of operation cannot be competed with by any other known method of power, and instead of being known as a necessary evil it has proven to be the boon of the modern efficiency engineer.

RECENT WATER DECISIONS IN WESTERN COURTS

BY A. E. CHANDLER

Lindblom vs. Round Valley Water Company.—(56 Cal. Dec. 13) Decided June 27, 1918.

The Round Valley Water Company since the early sixties has maintained a reservoir in Round Valley, Plumas County, impounding water by means of a dam at the head of North canyon. The water so stored has been sold from time to time to consumers at various points below the dam. Lindblom is the owner of mining property in North Canyon and brought action against the storage company on the grounds that the company was invading his rights by storing waters in the reservoir and controlling their outflow. The lower court entered judgment in favor of the defendant, holding that North Canyon is not a natural water course and that the waters stored in the reservoir had been applied to useful and beneficial purposes for more than forty years.

The Supreme Court of California in examining the evidence found that before any dam was constructed in Round Valley there was a discharge of water from the valley through North Canyon in the winter and spring of each year. The Supreme Court further found that "the evidence is clear to the effect that the water running into Round Valley consisted from the run-off from the usual, and annually recurring, fall of rain and snow." Following the well accepted principle that it is not necessary to the existence of a water course that the flow should be continuous throughout the year and further that the waters were not intermittent flood waters, the Supreme Court held that North Canyon is a natural water course and that riparian rights attach to water flowing therein.

The water from the reservoir was sold in past years almost solely for mining purposes. Since 1890 there has been a marked decrease in the number of mines supplied by the company so that for a period far in excess of five years the company has been selling "considerably less than the amount of water which, on an average, its reservoir was capable of supplying each day through the year." Under the principle laid down in Smith vs. Hawkins (110 Cal. 122) it is held that a non-use existing for five years constitutes a forfeiture of the right. In the present case, therefore, the plaintiff is entitled to have the amount so forfeited by said user flow down the stream in its accustomed course. The Supreme Court emphasizes the point, however, that this does not mean that the plaintiff may claim any benefit from the maintenance by the company of its reservoir. "His only rights are those which he would have had under the natural conditions existing before the dam was erected, subject to the deduction of so much of the water as defendant has continuously applied to a beneficial use. In other words, he cannot require the defendant to discharge any water into the stream during those months in which there would be no flow if no dam had ever been built. He may merely insist that, during the months of natural flow, the defendant shall permit the escape into the canyon of the surplus of the natural flow over and above what is required to enable the defendant to meet its reasonable needs, measured by its maximum requirements during the five years preceding the commencement of the action."

The leading case of forfeiture by non-user, Smith vs. Hawkins, deals with the non-use of a ditch. The present case is of importance because it deals with the non-use of a part of the waters stored in a reservoir.

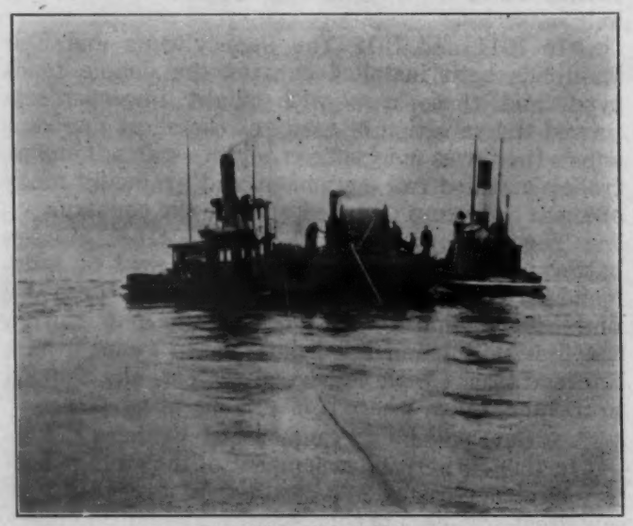
LAYING A THREE MILE CABLE

BY F. D. NIMS

Early in the year a sub-marine cable was laid across Puget Sound from Des Moines to Point Robinson on Vashon Island. This cable was in one piece 14,330 ft. in length, and consisted of three No. 6 Stranded Copper Conductors, Rubber Insulated and Steel Armored, no lead, and weighed approximately 5½ lbs. per foot.

The cable is insulated for a work pressure of 10,000 volts and the company is carrying on it 6600.

It was installed to supply the system of the Vashon Light and Power Company operating on Vashon Island where a small steam plant has been in



The cable reel in midstream

commission for the past three years. This plant is now shut down. The energy is being purchased from the Puget Sound Traction Light & Power Co., delivery being taken from Des Moines.

The cable came coiled in a Gondola car about two months before it was laid; it was taken from the car and coiled on the ground in close proximity to the slip where it was intended to transfer to the scow. A large reel was loaned by the Pacific Tel. & Tel. Company to which was geared an ordinary donkey engine; this was used only in reeling the cable on to the reel. Two tugs were used—one on each side of the scow, the donkey being taken out of gear from the reel and the cable allowed to unreel as the scow was towed across.

The reel was equipped with two hand brakes and provided with two emergency brakes made up of hard wood blocks and levers, but, as a matter of fact, in the actual laying of the cable only one of the hand brakes was used, although a stream of water from the fire pumps on one of the tugs was played on this brake continually.

THE CHOICE OF MATERIAL FOR PRESSURE PIPES

BY RALPH BENNETT

(The design of conduits subject to hydraulic pressure has proven a problem in engineering practice fraught with many difficulties. Especially has this been true in the West where the development of hydro-electric power has been undertaken on such a vast scale in the recesses of the high and rugged mountains. Here is a discussion on pressure pipe design that should prove interesting and profitable reading. The author is a consulting engineer with headquarters in Los Angeles.—The Editor.)

The cost of the pressure pipes and inverted siphon of a water conduit is frequently a very large percentage of the total expenditure, and in view of this a careful study of the available types is essential before construction is commenced. In the case of plants requiring considerable heads on the pressure conduits or on siphons the selection of the most economical type may be essential to the success of the project.

Steel Pipes

Of all pressure pipe materials steel has been considered to be far the best. It can be had as lap or butt welded or riveted pipe in an infinite variety of thickness and of diameters. It can be joined in a vast number of ways and furnishes in itself a complete self aligning, self contained conduit, needing only support. Heavy steel plates are reasonably long lived and can be readily repaired. The methods of fabricating and of protecting are well known and can be readily inspected at all times.

But aside from the present shortage in steel and in steel fabricating labor, there are certain other disadvantages inherent in its use on large or high head work.

Thick pipes require special joints, are difficult to make and are so heavy and cumbersome to transport that only very moderate diameters are possible. At both extremes the physical characteristics of the pipe limit the diameter and require the use of multiple pipes or the substitutes of some other class of construction.

A STEEL PIPE IN THE ANDES

Here is illustrated the repairing of a penstock break in a steel pipe line installed in th eprecipitous Andes Mountains of South America.

Only in rare cases does the main portion of the conduit of a water system fall along the line of a railway. Ordinarily there must be added to the normal cost of working with convenient access to material the added cost of transporting long distances over rugged country and sometimes of actually hoisting into place units weighing tons. Local materials and those which can be handled in small loads and assembled on the work possess great advantages over those which must be hauled from distant points and in large pieces. Under those conditions there are several alternate constructions of merit worthy of careful consideration. These have narrower limitations than the steel pipe but in many cases the advantages are very great.

For low heads and large diameters steel pipe must have a thickness much greater than that required for the internal pressure in order to take care of collapsing stresses due to negative internal pressure, as well as to shock. Large pipes even for considerable heads must have for general stability a thickness much beyond that required for the static pressure.

Concrete Pipe

Concrete pipes carefully reinforced and of dense waterproof concrete are in extensive and successful use up to heads of about 100 feet.

WOOD STAVE PIPING AT THE WISE POWER HOUSE

Over 8000 feet of this penstock pipe is made of wood stave construction. Note the piping as it winds up the mountain in the upper left hand corner.

They require for tensile and incidental stresses, almost as much steel as does an all steel pipe of the same diameter and head. This material is, however, less expensive in reinforcing rod than in riveted plate. The pipe is also much more rugged and requires less maintenance.

With the present development of blast placed concretes and of water proofing methods it would not be impossible to carry this class of work up to a much higher head. With proper metal lining very great pressures could be handled and a high velocity could be allowed.

The aggregate is usually a local product while cement can be had within a few hundred miles and rod steel for reinforcing is now rolled from billett and scrap in most of the larger cities. These materials can be hauled in any convenient sized units and cannot be injured by rough handling.

Wood Stave Pipe

Wood stave pipe has been used for heads up to about 200 feet for many years. It is somewhat perishable and requires constant maintenance. For a limited class of use particularly large pipes under slight or moderate heads, it is eminently suitable. The present high cost of plate steel is extending wood stave use up to heads as high as 400 feet. But while the bands may cost less than the equivalent plate steel, the difficulty of keeping stave joints tight under such heads must be a constant burden. The staves are readily transported provided only that they are carefully protected from injury. As but little plant is required during erection the pipe can be readily built in difficult locations.

PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(Factors involved in eliminating the residual voltage, due to capacitance unbalance. An elementary consideration of the field of inductive interference by an engineer prominent in the recent investigations of that subject made in the West.—The Editor)

Residual Voltage of Lines Isolated from Ground

Balanced and residual currents were discussed in the previous article of this series. In taking up residual voltages, the isolated power circuit will be first considered, and later the effect of grounded neutrals.

Consider a three-phase power circuit, isolated from ground, supplied with balanced three-phase voltages between wires. The voltages of the three wires to ground are determined by the impedances from wires to ground. In a well insulated line, free from tree-contacts and the like, the leakage resistance is so great as to be a negligible factor. Consequently, except where the line is so long as to involve the complications attendant on long electric circuits, the voltages to ground are determined by the relative capacitances of the conductors to ground.

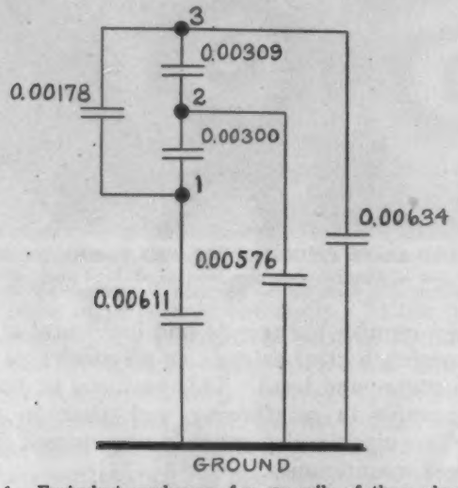


Fig. 1. Equivalent condensers for one mile of three phase line. Capacitances in microfarads

Fig. 1 shows a network of condensers equivalent to the capacitances of one mile of a vertical power circuit composed of three wires 0.257 in. in diameter, 5 ft. apart, with the lowest wire 40 ft. above the ground. The top wire (No. 3) has the greatest, and the middle wire, (No. 2) has the least capacitance to ground. With voltages between wires E_{12}, E_{23}, E_{31}, maintained equal in magnitude and 120° apart in phase, as in practice, the voltages to ground can be determined by the ordinary methods for solving electric circuits. These voltages to ground will not be equal and 120° apart in phase, since the capacitances to ground are unequal, or as often stated, "unbalanced." In this particular case the sum, or resultant of the three voltages to ground, $E_{1g} + E_{2g} + E_{3g}$ will be about 7 per cent of the voltages between wires. This amount by which the voltages to ground fail to sum up to zero is called the residual voltage. For an untransposed circuit it is independent of the length, being characteristic for a given configuration and relative dimensions.

Transposing the power circuit, so each wire occupies each position for equal intervals, equalizes the capacitances to ground and reduces the residual voltage to zero. But if there were a parallel for say 3 miles on a 40-mile line and the power circuit were transposed only within the parallel, there would still remain a residual voltage whose value would be something less than with no transpositions, depending on the location of the parallel.

The transpositions in the power line in the parallel would be effective in reducing induction from the balanced part of the voltages to ground, but would have no effect on induction from the residual voltage, except that the transposition might, as before mentioned, reduce the size of the residual voltage itself. That is, in order to reduce the residual voltage, due to capacitance unbalance, to the minimum, it is necessary to transpose the entire power circuit, and not merely that part within the parallel.

It will be evident that the residual voltage will have the same frequencies as are present in the supplied voltage waves. The configurations giving rise to the worst unbalances of capacitances to ground are those having all the conductors in one plane. The triangular configurations cause much lower capacitance unbalances, and, therefore, correspondingly lower residual voltages.

COST OF THAWING WATER SERVICES WITH ELECTRICITY

At the recent convention of the American Water Works Association considerable information regarding last winter's experiences with frozen water services was brought out in the discussions, according to a recent article in Engineering and Contracting. The costs of electrically thawing services in several of the cities are shown in the following table:

	Per service.	Remarks.
Paterson, N. J.	$ 8.20	Includes all expenses and overhead.
Madison, Wis.	10.00	Charge for thawing.
Kitchener, Ont.	2.00	Current 50 ct. per service.
Petersboro, Ont.	2-2.50	
Niagara Falls, Ont.	10.00	Charge by electric company.
Green Bay, Wis.	3.50-12	Electric light company charged $1.50 per hour for current and $3 per hour for men.
New Rochelle, N. Y.	15.00	Charge by electric light company.

WHAT IS A FAIR RETURN ON YOUR INVESTMENT

BY C. E. GRUNSKY

(How much should a public utility be allowed to earn on its investment — or should the rate of return be based on present value? A consideration of principles which is of particular interest in view of the many rate cases now before western regulating bodies, as well as several recent decisions of importance. The author is a well known consulting engineer and valuation expert of San Francisco.—The Editor.)

The business of every public service concern is subject to regulation and control by properly constituted authority. It will not be going too far to say that any business which is monopolistic in character should be considered subject, at the will of the public, to like regulation and control, even though there are as yet, ony the first symptoms apparent that there may in time be a full exercise of the public's right in this direction. But whenever the public controls and regulates a business, particlarly in the matter of fixing the price of the output, it is fundamental that any legitimate investment made for the benefit of the public must be adequately protected. Whatever sacrifice the owner of a public utility makes should be of a temporary character only. He should never be compelled to operate under conditions that leave the question of protection of his legitimate investment in doubt. Whenever this protection is not assured, the element of risk grows as a factor to be considered, and in some way or other the public must meet the resultant higher cost of the commodity or service. The time has not yet come when the public is willing to go so far as to guarantee to the owner of the public utility full protection against loss; but there are those who believe that it might be wise to extend such full protection, at least in the case of some of the more important public utilities. That this would in no small measure simplify the matter of rate fixing is self-evident. Meanwhile the rate of return to which the public utility owner is fairly entitled must be considered to be affected more or less by risk.

The fundamental requirement when the earnings of a public utility are to be limited, is, therefore, as has been stated, that they be adequate to afford protection to the investment. But the owner of a public utility is entitled, by right, to something more than a mere protection of investment. He, by reason of his experience and the credit which he and his associates and backers command, makes it possible for the community to enjoy the advantages of transportation, of adequate water supply, of telephone and telegraph facilities, of lighting and heating opportunities, which without his help, might have to be long deferred. The establishment of the public utility, due to his enterprise, immediately adds value to the land holdings and other property within the area served and in lesser degree, also to surrounding lands and property within the broader zone in which the property values are in any way affected by the growth of the community which is served by the utility. The owner of the public utility is therefore, a public benefactor and should be compensated not merely as an agent of the public would be compensated, but he should also get some reward for adding to the unearned increment of other property owners. He may in some instances profit as owner of appreciating property such as real estate, but in other instances full compensation should be otherwise arranged for, as for example, by allowing him to share in the general prosperity to which his financial resources have contributed.

How this compensation should be made, what its amount should be, and what factors should be taken into consideration when rates are to be fixed has been discussed in the previous articles of this series. It has been pointed out that to protect the investment adequately and fairly, a proper determination of this investment should be made and that undiminished by depreciation this investment will be the "natural rate base." It has also been pointed out that the compensation for management, hazard and participation in general prosperity can be more satisfactorily brought into relation with the volume of business than into relation with any rate base. There remain to be considered what the fair rate of return will be when viewed from various standpoints.

In the case of any "going concern" which is so firmly established that indefinite life and certainty of continuous earning capacity may be assumed, the business world recognizes as adequate some generally acceptable rate of return on the capital legitimately invested in the enterprise, supplemented by what may be called profit, which. ordinarily will be considered in its relation to the volume of business.

If the amount by which the dependable annual gross earnings exceed the operating expenses (the latter being here taken exclusive of interest on the invested capital) be capitalized at an interest rate, based on an acceptable rate of return as above defined, the aggregate value of the enterprise will be found. This will cover, in the case of the successful property, not alone the value of physical elements and the amounts actually expended for rights, privileges and easements but also the other elements of intangible value such as good will, going value, water rights, concessions, patents and the like.

It is an interesting study to determine for any class of enterprise, be they of a private character or in the public service class, what should be considered a fair rate of return on an investment adequate to establish an enterprise of the class in question and what would be a reasonable profit in excess of the earnings that would otherwise just cover this rate of return.

Unfortunately there has no attempt been made heretofore to thus subdivide the gross profits of public service concerns. It has seemed sufficient to say that a return of 7 or 8 or 9 per cent per annum as the case may be, computed on the value of the property, is a fair return. The value which is created by the net earnings is quite illogically made the base to be used in determining what the rate of return is.

How much better would it be to make the separation, which will certainly appeal to the business man, as above indicated into interest on the capital in the

business venture and profit expressed in relation to the volume of business.

When as in the case of water-works the amount of capital invested is ordinarily large in comparison with the annual income (volume of business), not infrequently 10 to 1, the defects of the ordinary procedure are not so striking as in the case of the concern which does a large annual business on a small investment. In the latter case the cost of money to the owners for use in the enterprise may be no greater than in the former and yet, if there were no return in excess of what would be a fair return on relatively large capital investments, the enterprise would not be undertaken.

There is, therefore, no standard fair rate of return that can be prescribed or that will prove acceptable unless the same be applied to investment and be supplemented with a profit which as stated should bear some relation to the annual volume of business.

But even when thus separated into two parts, the net earnings which should be considered adequate by a prudent business man are not determinable by any fixed standard. This is particularly true of the profit item when taken apart from and as an addition to interest on the capital reasonably and properly invested. This profit item will naturally fluctuate with the degree of risk and with the public's estimate of general prosperity, and with the value that may attach to business skill, integrity and responsibility involved in providing the plant and the business organization and directing its operation.

If money at interest in savings banks or invested in municipal or government securities regarded as safe brings an interest return of 4½ per annum, the money placed in industrial enterprises or into established and demonstrated public utilities should bring a return of at least 5 or 6 per cent. A fair return would be 6 or 7% provided, of course, that this return is free from the hazards of the business and from the responsibility of management. When an enterprise is in sucessful operation the owner thereof would expect to get money when he needs it at these rates and the lender would want not less than such a return because he, too, makes some sacrifice whenever he accepts paper, which may not be readily negotiable in the financial market. This being the situation, the owner, himself, expects and is entitled to some such a return on the money sacrifice which he has made to establish the business, or, if viewed from a slightly different standpoint, which he or any one else would have to make to reproduce and reestablish the business if the same were non-existent. But he would still be inadequately compensated if there were not some additional return in sight as already explained.

The rate fixing authorities have made it a practice, however undesirable this may be, of allowing certain rates of return on the value of the public service properties. There is, in this practice, a disregard of the elements which deserve special consideration. Thus for example, the owner of gas works or of a plant for supplying electric energy may be allowed, by rate fixing authorities to earn 8½ or a little more on the so-called fair value of his property, while if he is in the business of supplying water for domestic use he may be held down to 6 or 7%.

Rate of Return Defined

When the question is asked—What is a fair rate of return?—the first point to be determined will be the base to which this rate is to apply. This base may be either the investment, i. e., the natural rate base, or, as many would have it, the value of the property in question. The question, therefore, should be modified. It may be put in either of the following two forms:

1. **What is a fair rate of return on the value of the property?**
2. **What is a fair rate of return on the capital legitimately invested in the enterprise not diminished by depreciation (on the natural rate base)?**

While the first of these questions is apparently illogical because value results from earnings, it nevertheless deserves consideration. The owner as well as the rate-payer is interested in knowing whether the business falls into the class of enterprises in which net earnings may be capitalized at such low percentages as 5 or 6 or whether capitalization should be at higher rates. This is convenient and valuable information but in the matter of rate fixing leads nowhere until the limit to be placed on earnings has been otherwise determined. The interest rate of capitalization will vary according to the nature and the magnitude of the enterprise. It will, when ascertained, be applied to the net earnings which should include allowances for risk, for management, and for a share in general prosperity. This interest rate is not to be confounded with the rate of return on the investment, which in the case of the successful business will always be a higher rate, because in the successful business the investment is less than value.

The question in its second form will be vital so long as the rate base alone, without regard to volume of business, is taken into account, because upon the correct answer depends, not alone the protection of the owner's investment in the enterprise, but also the degree of encouragement to be given to others to place their financial resources at the disposal of the public by engaging in similar ventures.

Strictly speaking, therefore, and considered from the standpoint of the owner, the rate of return would be the amount per hundred, or the amount on some other unit, of the net earnings in relation to the capital which has actually been invested or which in the judgment of the public should be assumed to have been invested in the enterprise. The net earnings in the sense here used represent the excess of the income over operating expenses, the latter expression being used in its broadest sense, including a proper allowance for replacements. In the successful venture the rate of return will be such that the investment of capital therein will appear attractive. When the enterprise has been long established, well managed and is non-competitive, this rate may be relatively low without mitigating against the successful operation thereof, while, in the case of a new venture, the rate of return, immediate or prospective or both immediate and prospective, should be relatively high in order that the investment of capital may be encouraged and not repelled.

PRACTICAL PROBLEMS IN FUEL OIL SAVING

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Examples of the types of problems which the man interested in fuel oil conservation will be called upon to solve. A helpful application of principles to actual cases which should prove useful to central station operators and users of fuel oil.—The Editor.)

ILLUSTRATIVE PROBLEMS

Problem No. 1—The mean effective pressure of a single-acting oil engine cylinder under test is found from an indicator card to be 43.9 lb. per sq. in.; the cylinder has 47.5 working strokes per minute; the diameter of the cylinder is 30 in.; and the length of stroke is 30 in.

What is its horsepower?

Solution.

By reference to formula for horsepower computation, we find for

$$P = 43.9,\ L = \frac{30}{12},\ A = .7854\ (30)^2,\ \text{and}\ N = 47.5\ \text{that}$$

$$\text{H. P.} = \frac{\text{PLAN}}{33000} = \frac{43.9 \times 2.5 \times 706.9 \times 47.5}{33000} = 111.7$$

Problem No. 2—In a turbine test the atmospheric barometer reduced to the 32° F. standard of measurement, read 29.93 in.

If the condenser vacuum reduced to the same standard read 28.23 in. of vacuum, what was the absolute pressure in the condenser?

Solution.

Barometer for day	29.93 in.
Vacuum maintained	28.23 in.
Pressure in condenser in inches of mercury..	1.70 in.

14.696 lbs. per sq. in. = 29.92 in. of mercury.

$$\therefore \frac{14.696}{X} = \frac{29.92}{1.70}$$

$$X = \frac{14.696}{29.92} \times 1.70 = .835 \text{ lbs. per sq. in. absolute pressure in condenser.}$$

Problem No. 3—A 10,000 kw. turbine under test operated with a gage reading of 171.5 lb. per sq. in. The gage, however, read one pound too low. The computed absolute pressure was found to be 187.2 lb. per sq. in.

What was the barometer reading for the day?

Solution.

Absolute pressure	= 187.2 lb. per sq. in.
Corrected gage pressure (171.5 + 1)	= 172.5 lb. per sq. in.
Atmospheric pressure	= 14.7 lb. per sq. in.

$$\frac{14.696}{14.7} = \frac{29.92}{X}$$

$$\therefore\ X = \frac{29.96}{14.696} \times 14.7 = 29.93 \text{ in. of mercury barometer reading for the day.}$$

Problem No. 4—A corrected atmospheric barometer reading is found to be 29.942 in. of mercury on the 32° F. standard.

How many lbs. per sq. in. does this represent?

Solution.

To convert to lb. per sq. in. by formula in the chapter on pressures:

$$\frac{I_m}{P} = \frac{29.921}{14.696}$$

$$\text{or}\ 29.942 = 2.046\ P$$

$$\therefore P = 14.670 \text{ lb. per sq. in.}$$

Problem No. 5—A corrected barometer reading is 29.937 in. of mercury on the 30-inch vacuum standard.

What is the pressure in lb. per sq. in.?

Solution.

To convert to lbs. per sq. in. from formula in the chapter on pressures:

$$\frac{I_m}{P} = \frac{30}{14.7}$$

$$\text{or}\ 29.937 = 2.041\ P$$

$$\therefore P = 14.668 \text{ lb. per sq. in.}$$

Problem No. 6—(a) At what temperature do the Fahrenheit and Centigrade scales read the same? Fahrenheit and Reamur? Centigrade and Reamur?

(b) Assuming the absolute zero of the Fahrenheit scale to be 459.6° F. compute the absolute zero on the Centigrade and Reamur scales.

Solution.

(a) Fahrenheit and Centigrade.

Relation is given by formula:

$$F - 32 = 9/5C$$

When the scales have identical numerical readings, then

$$F = C = X$$

Substituting in formula

$$X - 32 = 9/5X$$

$$4X = -160 \qquad \text{or } X = -40°$$

$$\therefore -40°F = -40°C.$$

Fahrenheit and Reamur.

Relation is given by formula:

$$F - 32 = 9/4R$$

Let $F = R = X$, then $X - 32 = 9/4X$

$5X = -128$, or $X = -25.6$

$$\therefore -25.6°F. = -25.6°R.$$

Centigrade and Reamur.

Relation is given by formula:

$$C = 5/4R$$

Let $C = R = X$, then $X = 5/4X$

$4X = 5X$ or $X = 0$

$$\therefore 0°C = 0°R$$

(b) Absolute zero = —459.6° F.

Let us substitute this value of F in the general relationship, and we have

$$F - 32 = 9/5C$$

and we have

$$-459.6 - 32 = 9/5C$$

$9C = -2458$ or $C = -273.1°$ absolute zero on Cent. scale.

Similarly for the relationship

$$F - 32 = 9/4\,R$$

we have

$$-459.6 - 32 = 9/4R$$

$$9R = -1966.4$$

$R = -218.049$ = absolute zero on Reamur scale.

Problem No. 7—The temperature of the steam entering a turbine during a test was found to be 521.2° F.; the correction for stem exposure of the thermometer was 5.6° F.; the corrected steam gage reading 172.5 lb. gage; and the atmospheric barometer read 14.7 lb. per sq. in.

What was the superheat of the steam?

Solution.

Thermometer reading on entering steam = 521.2°
Correction for stem exposure = + 5.6°
True temp. of steam entering turbine = 526.8° F.
Absolute pressure = 172.5 + 14.7 = 187.2 lb.
From steam tables the temperature corresponding to this pressure of saturated dry steam = 376.4° F.
∴ Degrees of superheat = 526.8° — 376.4° = 150.4°

Problem No. 8—The temperature of the superheated steam entering a turbine during a test was found to be 544.8° F. The pressure of the steam in the main was 182 lbs. abs.

What was the superheat of the steam?

Solution.

By reference to Table 2 of the steam tables the temperature of saturated steam corresponding to 182 lbs. pressure is found to be 374.0° F. Subtract this value from the temperature of the steam entering the turbine and the result will be the degrees of superheat, or

$$544.8 - 374.0 = 170.8° \text{ F. superheat}$$

Problem No. 9—Regnault's classic formula for total heat of saturated steam is:

$$H = 1091.7 + 0.305\ (t-32)$$

Compute the total heat of saturated steam at the boiler pressure corresponding to 382.3° F.

Solution.

Substituting, we have

$$H = 1091.7 + 0.305\ (382.3-32)$$
$$= 1091.7 + 106.84$$
$$= 1198.54 \text{ B. t. u. per lb.}$$

From tables H = 1198.2

$$\therefore \text{Error} = \frac{1198.54 - 1198.2}{1198.2} = \frac{.34}{1198.2}$$
$$= .0284\%$$

Problem No. 10—Compute the total heat of saturated steam at 382.3° F. by the formula:

$$H = 1150.3 + 0.3745\ (t-212) - 0.000550\ (t-212)^2$$

Solution.

Substituting the value of temperature, we have

$$H = 1150.3 + 0.3745\ (382.3-212) - 0.000550\ (382.3-212)^2$$
$$= 1150.3 + 63.78 - 15.95$$
$$= 1198.13 \text{ B. t. u. per lb.}$$

From tables H = 1198.2

$$\therefore \text{Error} = \frac{1198.2 - 1198.13}{1198.2} = \frac{.07}{1198.2}$$
$$= .00585\%$$

Problem No. 11—The specific volume of saturated steam is represented on page 104 of Marks and Davis Steam Tables by the formula:

$$S = 28.424 - 0.01650\ (t-320) - 0.0000132\ (t-320)^2$$

Find the specific volume of steam for t = 382.3.

Solution.

Substituting, we have

$$S = 28.424 - 0.01650\ (382.3-320) - 0.0000132\ (382.3-320)^2$$
$$= 28.424 - .862 - .036$$
$$= 29.525$$

N. B.—This formula evidently does not check up at all for this temperature, since the specific volume for a temperature of 382.3° F. is 2.279 from the steam tables.

Problem No. 12—The mean specific heat of steam is represented mathematically on page 92 of Marks & Davis Steam Tables by the formula:

$$C_m = 0.9983 - 0.0000288\ (t-32) - 0.0002133\ (t-32)^2$$

What is the mean specific heat of steam for t = 382.3°F.?

Solution.

Substituting, we have

$$C_m = 0.9983 - 0.0000288\ (382.3-32) + 0.0002133\ (382.3-32)^2$$
$$= 0.9983 - 0.0000288\ (350.3) + 0.0002133\ (350.3)^2$$
$$= 0.9983 - 0.0101 + 26.17$$
$$= 27.1582 \text{ Mean specific heat.}$$

Evidently a mistake is made in translating the last term of this formula from its original source, for it should be $.0000002133\ (t-32)^2$. On this basis, we have that

$$C_m = 0.9983 - 0.0101 + .02617 = 1.0346$$

In the steam tables the heat of liquid for 382° is 355.0 B. t. u. and for 383° is 356.1 B. t. u. Hence the mean specific heat C_m is approximately 1.1, which indicates that had the decimal points been carried further the specific heat approaches that set forth in the above correction.

Problem No. 13—At a certain central station there are four 773 boiler horsepower Parker boilers. These boilers were used to give a 10,000 kw. load at the terminals of a turbine which has an over-all efficiency of 21 per cent. What was the percentage of overload on the boilers?

Solution.

$$\frac{10000}{.21} = 47{,}600 \text{ kw. actually taken from boilers (neglecting losses in steam mains)}$$

Since 1 hp. = .746 kw.

$$\frac{47600}{.746} = 63{,}800 \text{ mechanical horsepower actually taken off boilers.}$$

From discussion in text, we have

$$\frac{34.5 \times 970.4 \times 777.5}{60 \times 33000} = 13.14 = \text{ratio of boiler horsepower to mechanical horsepower.}$$

$$\therefore \frac{63{,}800}{13.14} = 4850 \text{ Bl. h. p. actually taken from boiler.}$$

4 × 773 = 3092 Bl. h. p. rated capacity.

$$\therefore \frac{4850-3092}{3092} \times 100 = 56.8\% \text{ overload.}$$

Problem No. 14—What is the equivalent evaporation in lb. of water per hr. from and at 212° F. if the water fed to a boiler has a total weight of 64494 lb. and the factor of evaporation is 1.193 lb.?

Solution.

By applying the fundamental formula developed in the text, we have at once equivalent evaporation from and at 212° F. = 64494 × 1.193 = 76950 lbs.

Problem No. 15 — In a boiler test, the temperature of a boiler generating dry saturated steam under a pressure of 98.1 lb. per sq. in. abs. and receiving its feed water at 58.8° F.

Solution.

Total heat of saturated steam at 98.1 lbs. abs. = 1186.
Heat of liquid at temperature 58.8° F. = 26.88

$$\therefore F_e = \frac{1186 - 26.88}{970.4} = 1.193$$

INFRINGING PATENTS IN GOVERNMENT CONTRACTS

BY WM. K. WHITE AND H. G. PROST

(The liability of a contractor for a patent infringement in meeting government contracts—or when his product is used by the government in an article which infringes a patent. A Supreme Court decision and a new Bill which protects the contractor.—The Editor.)

For some time past, it was generally understood and believed that anyone, manufacturing articles for the United States Government under the terms of a government contract specifying the character and construction of such articles, could not be held liable for the infringement of any patent covering such articles.

This question of liability was finally determined by the Supreme Court of the United States in two cases recently decided by it. In the case of William Cramp & Sons v. International Curtis Marine Turbine Co., the Cramp Company was awarded a contract by the Navy Department to build a number of torpedo boat destroyers for the Government. The Curtis Company brought suit against the Cramp Company for the infringement of certain patents covering the type of engine installed in such boats and the Cramp Company, by way of defense, asserted that, under the Act of Congress of June 25, 1910, "The United States, by act of eminent domain, acquired a license to use the invention of all existing patents, and, therefore, the transactions under the contracts for torpedo boat destroyers, being merely the building of devices for a licensee under the patent in suit, were licensed transactions, and consequently" the defendant could not be held liable or accountable therefor.

In overruling this defense, the Supreme Court said:

"The making of a contract with the United States and the resulting obligation to perform duties in favor of the United States by necessary implication imposes the performance in accordance with the law of the land; that is, without disregarding the rights or appropriating the property of others."

"A contractor with the United States, therefore, is, in the very nature of things bound to discharge the obligation of his contract without violating the rights of others, and merely because he contracts with the United States is not vested with the power to take the property of others upon the assumption that, as a result of the contract with the United States, he enjoys the right to exercise public and governmental powers possessed by the United States."

In the case of Marconi Wireless Telegraph Company of America against Emil J. Simon, the Supreme Court also held that a contractor was liable for infringing patents notwithstanding his infringing acts were performed in carrying out a contract with the government. In this case, however, another question was also passed on. The defendant contended that the devices made by him for the government did not embody the patented inventions although they were intended for use in a complete apparatus which would infringe the patent when used by the government.

Under ordinary circumstances, a manufacturer, who sells parts of a device to one intending to and who does combine them in a complete apparatus which infringes a patent, is held liable as a contributing infringer because he contributes to or aids in the infringement of the patent by the purchaser of such parts. In the Simon case, the court held that Simon was not liable as a contributory infringer if the parts furnished by him did not, in themselves infringe, it being immaterial if their use by the government, with additional parts, did infringe. On this point the Court said:

"* * no illegal interference with the rights of the patentee arose or could arise from the mere furnishing to the Government of the United States of the parts which were not per se infringements, even although the use by the United States would infringe the patents."

The rendition of these two decisions, holding a government contractor liable for patent infringements, necessarily interfered with the carrying out of government contracts for apparatus and material required for the prosecution of the war. No doubt, it was for this reason that on July 1, 1918, the President approved the Naval Appropriations Bill which amends the Act of Congress of June 25, 1910, which was interpreted by the Supreme Court in the two cases above discussed.

The Bill of July 1, 1918, apparently protects any government contractor from infringement suits based upon his acts in carrying out any government contract. The Bill provides as follows:—

"That whenever an invention described in and covered by a patent of the United States shall hereafter be used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same, such owner's remedy shall be by suit against the United States in the Court of Claims for the recovery of his reasonable and entire compensation for such use and manufacture."

This Bill does not cover infringements occurring prior to July 1, 1918 in respect to articles delivered before that date to the government.

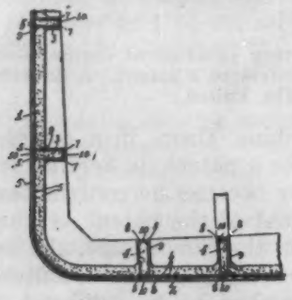
The Bill evidently means that no infringement suit can now be maintained against a contractor hereafter making articles for the government, and that the patent owner's only remedy is a suit against the government in the Court of Claims at Washington, D. C.

NEW IDEAS FROM THE WEST

Reinforced Concrete Ships

Patent No. 1,264,314, issued to Alan Macdonald, of San Francisco, California, and assigned to the San Francisco Ship Building Company, discloses one form of reenforcing used in the construction of reenforced concrete ships. In this construction, the vertical side and horizontal bottom of the ship are each provided with longitudinally extending beams, and reenforcing bars are arranged in the beams and in the sides and bottom.

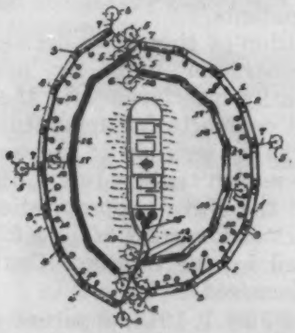
The reenforcing bars in the beams are tied to the reenforcing bars in the walls and bottom by two-part stirrups,



one end of which engages the reenforcing bars in the beams, and the other end of which engages the main reenforcing bars in the bottom and sides.

Floating Breakwater

Patent No. 1,264,756, issued to Jonathan Begg, of Oakland, California, shows a novel form of floating breakwater for producing an area of quiescent water around a submerged vessel. This breakwater consists of an outer and an

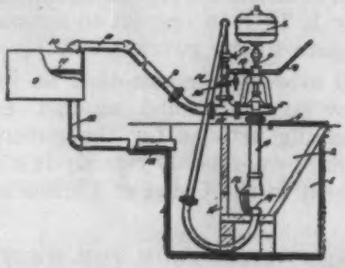


inner line of floats, the outer floats carrying a flexible pipe line from which oil is distributed onto the water.

The inner floats, which are spaced from the outer floats, are connected together and form a substantially continuous wall within the outer floats. Both lines of floats are connected to anchors so that they are held in a predetermined position.

Apparatus for the Transportation of Solids in Pipe Lines.

Patent No. 1,264,688, issued to August Schilling, of Oakland, California, shows a novel form of apparatus for the transportation of solids in pipe lines. This apparatus comprises a sump filled with liquid and a hopper within the sump containing solids suspended in the liquid. Depending into the sump is the intake pipe of a pump so that when the

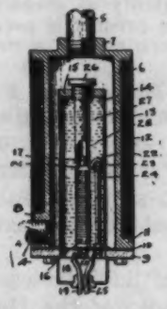


pump is operated a mixture of liquids and solids is pumped out through a pipe line to a distance point where the solids are separated from the liquids by filtration, or screening or otherwise, and the liquids allowed to flow back to the sump.

An injector nozzle is arranged in the hopper adjacent the suction pipe intake, and operates to agitate the mixture to cause a large proportion of solids to be carried by the liquids and to cause these solids to flow into the pump intake pipe. The water discharging from the injector nozzle is taken from the discharge side of the pump.

Electric Water Heater

Patent No. 1,265,213, issued to Otto A. Knopp, of Oakland, California, shows a novel form of electric water heater. This water heater comprises an enclosing casing, having inlet

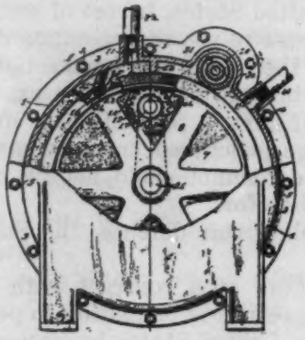


and outlet openings. Arranged within the casing is a hermetically sealed expansive shell, and within the shell is a thermostatic heating element.

Within the shell and arranged in contact with the heating element, are means varying the wattage of the element by the expansion and contraction of the shell.

Rotary Engine

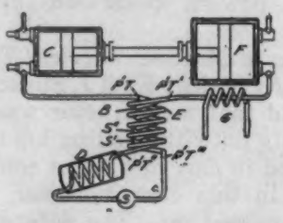
Patent No. 1,265,193, issued to James H. Guinn, of Long Beach, California, shows a rotary engine of peculiar design. This engine comprises a housing, having an annual chamber therein, within which a rotor is yieldingly suspended. Sup-



ported in the housing and constituting a support for the rotor, is a driven element which is rotated by the rotor.

Condensing Apparatus

Patent No. 1,264,399, issued to Philip Jones, of Santa Maria, California, discloses a novel apparatus for the separation of condensate from gaseous mixtures. This apparatus is particularly adapted for the condensation of the gases derived from oil wells. The hot gases are first conducted to an expansion engine, in which they are caused to do work and thus give up heat, and are then conducted through a heat interchanging apparatus to further lower their temperature, and are then passed through a condenser or other cooling



means to produce further condensation, and the material condensed is then removed from the circuit.

The cooled gases then pass back through the interchanger, cooling the gases which are passing in the opposite direction and absorbing heat from them, and are then introduced into a compressor having been previously heated, and from the compressor are conducted back to the intake side of the expansion engine.

SPARKS—Current Facts, Figures and Fancy

(Letting the Kaiser pay for the heat—An electrical substitute for the partnership towel—A Red Cross electrical helper—The role of electricity in winning the war—Odds and Ends of timely electrical interest.—The Editor.)

An electrically heated garment which operates somewhat after the principle of an electric warming pad is designed to keep aviators warm in the intense cold of the higher air. Current from a storage battery is supplied by adjusting a contact screw. The outfit includes foot covering, gloves and hood.

* * *

The cost of careless fires in the United States alone is estimated at over 170 million dollars in a year. Thirty thousand aeroplanes and 150 destroyers were not built because their cost was burned up. The United States each year destroys by fire enough property to pay the interest on three Liberty Loans.

* * *

To do away with towels in public places, an electric blower has been put on the market which is said to accomplish the effect very satisfactorily. An electric fan draws air from the outside over a heated coil and discharges it in sufficient volume to produce, it is claimed, not only a pleasing effect, but to create a drying process as rapidly as can be secured with a linen towel.

* * *

The necessity for cutting 65,000 yards of material into 1600 dozen garments in a week's time has been met by the Atlantic division of the Red Cross by the adoption of an electrical cutting machine which cuts through 260 layers of cloth at once. Further electrical contrivances for spreading the cloth and cutting stencils which serve as patterns complete the equipment.

* * *

One telephone company reports a telephone installation inside a refrigerator, where the temperature is maintained around 34° Fahrenheit. Another is installed on a houseboat. The place where this latter was anchored was inaccessible except by boat from several blocks away and it required some ingenuity to connect up the wiring.

* * *

At the present time the United States Government is one of the largest users of cold-storage space. Each month we now ship to the allied nations more than 70,000,000 pounds of cold-storage and frozen beef, and it is anticipated that shipments will be largely increased. Additional cold-storage facilities are a growing need in our efforts to feed the allies and our army.

* * *

An organized effort to make Mandarin the only spoken language of China and to do away with a hundred dialects now in existence is to be made immediately through an effort of the normal colleges to teach it to country teachers. Even Chinese themselves find it difficult to travel under present conditions and when it is appreciated that the word for egg in the south is the worst sort of profanity in the north, some of the complications may be realized.

* * *

A newspaper item says that the taxicab company of the city of Paris has discovered a mixture making possible the utilization of the abundant supply of alcohol in France. Gasoline and alcohol will separate at the carburetor, but when a mixture of 50 per cent alcohol, 25 per cent benzol and 25 per cent gasoline is used the mixture will not separate. This mixture can be used in present engines.

* * *

The electrically charged wires in front of the German trenches are reported to be saving fuel for at least one of our boys in France. This trooper brought an electric foot warmer and a coil of wire back from his leave, and after a brief and successful sortie to connect up with the enemy's defences, is enjoying in his dugout all the comforts of home in a steam heated apartment.

* * *

Riveting scores promise to become a favorite sport this summer. Prior to the war a pneumatic riveting gang of three men was commonly expected to drive only about 300 rivets (¾-in.) a day (see Gillette's Handbook of Cost Data, p. 1717). The best day's record on the Northwestern Elevated Railway construction, for example, was 500 rivets per gang. A recent record from Glasgow claims 6783 rivets in nine hours and bids fair to be broken by some of the American gangs any day.

* * *

The Army Medical Department has developed a mobile X-ray outfit, carried on a standard army ambulance slightly modified. This outfit includes an X-ray table, a dark room, also a complete set of apparatus for the localization of foreign bodies. Fully as expert work can be done with this mobile outfit as in any base hospital X-ray department. Its use in the field makes it possible for the surgeon at the front to send a complete report of a soldier's condition when a man is transferred to a hospital back of the lines.

* * *

Carlow, a small Irish city, situated about 38 miles from Dublin, claims the distinction of being the first town of its size in the world to be lighted by electricity. The system was installed in 1884. American education and training were, however, responsible for Carlow's leadership as William J. Handley, the engineer who did the work, was the American son of Irish parents. The original electric lighting system in Carlow consisted of iron posts about eight feet high, on each of which was placed a single incandescent lamp behind which was set a reflector about 12 inches in diameter.

PERSONALS

H. P. Pitts has resigned as commercial manager of the San Francisco district of the Pacific Gas & Electric Company to accept the position of purchasing agent for the great Liberty Plant of the Bethlehem Ship Building Corporation, Ltd., which is soon to be constructed at Alameda, California, where five thousand men are to be employed in its erection. This splendid new promotion comes as no surprise to the many friends of Mr. Pitts who have followed his long and efficient service to the electrical industry in the West. Now that electrical energy is playing such a vital part in the building of ships it is hoped that Mr. Pitts' new field of endeavor will be one of the strong personal factors that will aid in bringing in closer touch the leaders of that industry with the affairs of matters electrical.

Newcomb Carlton, president of the Western Union Telegraph Company, was a recent visitor in San Francisco.

A. D. Church of the Midland Counties Public Service Corporation at San Luis Obispo, Cal., has joined the army.

S. A. Bishop of the Pacific Electric Company of Los Angeles has spent several days in San Francisco recently.

A. S. Merrill of the Chicago Fuse Manufacturing Company is visiting Pacific Coast cities, now being at San Francisco.

A. McLachlan, sales manager Square D Company, has returned to Detroit after visiting Pacific Coast in the interest of his firm.

F. A. Bauman, of the F. A. Bauman & Company, Portland, Ore., has been spending some time in Los Angeles, Cal., on a business trip.

R. S. Masson and **H. S. Aller** of the Arizona Power Company of Phoenix, Arizona, have been in San Francisco during the past month.

Willard B. Felton, first engineer of the Arkansas Valley Railway Light & Power Company's Pueblo, Colo., plant, has joined the U. S. Marines.

Wynn Meredith, member of the firm of Sanderson and Porter, has returned to San Francisco after completing an oil pipe line in Oklahoma.

H. L. Jackman, general manager Western States Gas & Electric Company at Eureka, Cal., has returned from a trip through central California.

F. J. Airey, Los Angeles manager of the Pacific States Electric Company, is making an extended trip through the East, being accompanied by his wife.

J. P. Simpson, treasurer of the Tacoma (Wash.) Gas Company, has been elected a trustee of the Tacoma Commercia Club and Chamber of Commerce.

Franklin C. Webber has given up his work with the Southern California Edison Company at Los Angeles to become an electrician in the U. S. Naval Reserve.

Elmer Dover, vice-president of H. M. Byllesby & Company, in charge of Pacific Coast properties, has been elected president of the Tacoma (Wash.) Council of Boy Scouts.

D. P. Fullerton, A. H. Griswold and **W. H. Fairbanks** are among the former employes of the Pacific Telephone & Telegraph Company to have attained the military distinction of the major's title.

Lieutenant A. E. Morphy, formerly secretary of the Southern California Edison Company, Los Angeles, has been assigned as military instructor at the California School of Mechanical Arts, San Francisco.

C. H. Pierson, publicity director for the Southern California Edison Company, made a recent visit to San Francisco in connection with his company's appeal for higher rates now before the Railroad Commission of California.

J. C. Willever, vice-president of the Western Union Telegraph Company, accompanied by **G. M. Yorke, W. N. Fashbaugh** and **W. C. Merly**, have been recent Pacific Coast visitors, spending several days in San Francisco.

C. H. Minor, of the Western Electric Company, and Mrs. Minor are reported to have been visiting in Peking during recent weeks. Mr. Minor has completed arrangements for the establishment of a plant of his company in China.

A. B. Vandercook has been appointed sales manager of the Western Electric Company at Los Angeles. He was first employed by the company in 1916 as a salesman and for the last six months he has been a specialist at Los Angeles.

Tyler Holmes, formerly manager of the New Haven office of the Western Electric Company, has been appointed manager of the Denver office to fill the vacancy left by the late Alexander Brown. **A. W. Bates** will take Mr. Holmes' place in New Haven.

B. D. Goodrich, who resigned as city engineer of Lansing, Mich., sailed from San Francisco July 27th for China, where he will be engaged in making surveys, plans and estimates for rebuilding a portion of the grand canal of China, a section about 210 miles in length.

William Hood, chief engineer of the Southern Pacific Railway and dean of American railroad construction men, is retiring from active service. In appreciation of the splendid service rendered to the engineering profession in his active years, Mr. Hood some months ago was elected an honorary member of the San Francisco Engineers' Club.

C. B. Merrick has resigned as circulation manager of the Journal of Electricity to become an instructor with the Military School of Aeronautics at the University of California, which is now turning out hundreds of aviators each month. Mr. Merrick is a graduate of the University of California with the class of 1914 and has done very able work both for the Journal and for the Pacific Gas & Electric Company, in whose employ he was formerly engaged. The Journal of Electricity is represented in government service to an unusually high percentage of its workers. Other former directors and members of its staff, now in the service of the nation are: **A. M. Hunt**, member of the U. S. Naval Consulting Board, New York City; **Professor Alexander McAdie**, lieutenant commander U. S. Navy, Cambridge, Mass.; **Jas. H. Mosely**, first lieutenant Signal Reserve Corps Aviation Section, Portland, Ore.; **Edward B. Strong, Jr.**, second lieutenant Company F, 159th Infantry, Camp Kearney, Cal.; **W. A. Strong**, electrician U. S. Naval Radio Service, Guam; **Daniel Gallick**, 119th Engineers, Camp Fremont, Cal. In addition to giving of its personnel and being placed in the one hundred per cent class for Liberty Loans and other patriotic drives, the Journal of Electricity is itself engaged in a helpful war service campaign assisting the various governmental departments in forwarding their publicity work throughout the West.

Lieutenant C. A. Sanborn of the Los Angeles office of the Western Electric Company entered the service in October, 1917, as just plain private but was made first lieutenant in April. Here is a brief sketch of Lieutenant Sanborn in Western Electric News: "Sandy—he won't mind if we tell—is twenty-six, is a Boston Tech. man of '14 and has been with the Western Electric Company since 1915. He is the only son of Mr. and Mrs. A. G. Sanborn, of Los Anglees. A very interesting letter has just been received from Sandy from somewhere in the U. S. A. in which he tells about the Engineering Squad with which he is connected erecting and taking down 110 feet of bridge over still water in 19½ minutes—that's going some."

E. C. Arnold, formerly in the combustion department of the Denver Gas & Electric Light Company, Denver, Col., is a first lieutenant in the Signal Corps and acting as instructor in radio mechanics. He attended the Second Officers' Training Camp at Fort Sheridan, Ill.

P. B. Findley, technical editor in the Department of Publicity, Westinghouse Electric & Manufacturing Company, has resigned from that position to enter the Training School at the University of Pittsburgh where he will take a special course in radio work, with the Signal Corps.

F. R. Fishback, sales manager of the Electric Controller & Manufacturing Company, Cleveland, Ohio, is spending some time on the Pacific Coast for the purpose of establishing local representatives. He reports excellent business in their material and is enthusiastic over the future outlook.

B. W. Paul, of Portland, Ore., attended the convention of the National Association of Electrical Contractors and Dealers at Cleveland, Ohio, having been appointed a substitute for the regular executive committeeman, Samuel C. Jaggar, who found it impossible to attend at this time.

A. F. Pillsbury has been appointed district manager for the Pacific Coast district under the Emergency Fleet Corporation in the nation-wide effort being made to speed up production. The Pacific Coast records still remain to the front, but the national schedule calls for even higher speed.

F. W. Ballard has been appointed power specialist attached to the office of the Vice-President of the Emergency Fleet Corporation in charge of construction. Mr. Ballard will be in charge of the interests of the Corporation in the matter of power requirements for shipbuilding and associated industries.

Martin H. Clapp has been appointed manager of the telegraph section, division of operation of the Railroad Administration with office in the Southern Railway Building, Washington, D. C. Mr. Clapp will have supervision over telegraph and telephone lines belonging to the railroads under Federal control.

O. S. Lair, connected with the Western Electric Company as department manager in various cities of the United States for the past 17 years, and for the last four years manager of the Los Angeles (Cal.) office of the company, has resigned to become associated with the W. Ross Campbell Company, Los Angeles.

Ralph Wiseman, proprietor of the Electric Fixture & Supply Company, Ellensburg, Washington, attended the convention of the National Association of Electrical Contractors and Dealers held at Cleveland, Ohio, July 15 to 20. He went as representative of the Washington Association of Electrical Contractors and Dealers.

William A. Stacy, who for the past ten years has been connected with the Bryant Electric Company, Bridgeport, Conn., first as salesman, then as Pacific Coast manager, and later as field representative and recently special representative, has been appointed Western manager of the company, and will make his headquarters at 323 West Jackson Blvd., Chicago, Ill.

J. F. NePage of Nepage, McKenny Company, electrical engineers and contractors of Seattle, attended the annual convention of the National Association of Electrical Contractors and Dealers held at Cleveland on July 15 to 20. NePage is a member of the executive committee of the National Association. While in the East he will visit a number of the larger cities.

Fred A. Rasche, engineer for the Public Service Commission of Oregon, is making a three-months tour of the country to obtain data for his work. Among the cities visited or to be visited by Mr. Rasche are Denver, Omaha, St. Paul, Madison, Milwaukee, Chicago, Toledo, Detroit, Buffalo, Rochester, Albany, Worcester, Boston, New Haven, New York, Philadelphia, Baltimore, Norfolk, Washington, Pittsburg, Cincinnati, Indianapolis, St. Louis, Kansas City, Los Angeles and San Francisco.

A. P. Davis of Washington, D. C., director of the United States Reclamation Service; **F. E. Weymuth** of Denver, Colo., chief of construction, and **F. K. Tiffany,** project manager of Yakima, recently visited the lower Snake river project of Oregon with a view of inspecting the proposed site. The inspection was part of a general campaign that has been instituted by the government for the purpose of determining what water power and reclamation projects are most feasible and accessible for the expenditure of government money in preparing work and possibly homes for the returning soldiers.

Major G. F. Sever, Engineer Officers' Reserve Corps, has established headquarters at San Francisco as representative of the Power Committee of the War Industries Board. He is making a comprehensive examination of the power situation in the western states with special reference to the supply of power for work essential to the war. He will also report upon existing sources of power that can be advantageously developed for government chemical works in connection with the plants for the manufacture of nitrate, alkali and chlorine gas plants, or powder ferric alloys or other Government requirements.

Julius Kruttschnitt was elected President of the Southern Pacific Company at a recent meeting of the board of directors, succeeding Wm. Sproule, who resigned to become Federal Director, United States Railroad Administration. **Paul Shoup,** president of the Pacific Electric Railway, was elected director and also vice-president and assistant to the president. Shoup will be the executive representative of the Southern Pacific Company on the Pacific Coast, with headquarters in the Southern Pacific Building in San Franicsco.

HONOR ROLL

The following names of western men are among those honored by gold stars on their various service flags:

Gillan Kane, lieutenant in the Aviation Corps, died at training camp, formerly with the Western States Gas & Electric Company at Eureka, California.

A. H. Romwaldi, lieutenant in the Italian Army, killed in action, formerly with the Western States Gas & Electric Company at Stockton, California.

George G. Watts, private, Company K 162d Infantry, 41st Division, A. E. F., France died of pneumonia. He was formerly with the Oregon Power Company at Corvallis, Ore.

OBITUARY

Alexander Brown, for twelve years manager of the Western Electric Company at Denver and Salt Lake City, died of heart disease Saturday evening, June 1st, while on his way to his mountain cottage at Crescent.

Arthur B. Hicks, for five years a special agent of the Puget Sound Traction Light & Power Company, in the detection of crimes and recovery of property stolen from that company and other Stone & Webster properties in the northwest, died recently at Seattle of spinal meningitis.

MEETING NOTICES FOR ELECTRICAL MEN

(The vacation month of July shows few past meetings but reveals several future conventions of importance. First among them is the quarterly meeting of the Pacific Division, Electrical Supply Jobbers, which has been postponed so as to just precede that of the Northwestern Electric Light & Power Association. This action is most commendable in view of the present necessity for conservation and limitation of travel and should be the means of augmenting attendance at both meetings.—The Editor.)

California Electrical Cooperative Campaign Activities

Three members of the Advisory Committee, including Mr. Reid, president of the California Association of Electrical Contractors and Dealers, and Mr. Brainerd, field representative of the campaign, met with a group of contractors and dealers and central station men at Modesto, on July 11th.

This meeting followed a week's activity on the part of Mr. Brainard in that territory and resulted in a section of the California Association of Electrical Contractors and Dealers being organized, with headquarters at Modesto, known as the Sierra Section of the California Association of Electrical Contractors and Dealers. It started with seven members, five of whom were new members in the California Association. There is every evidence that there will be additional members to join the Section within a short time.

The get-together dinner for the San Joaquin valley territory planned at Fresno for August 2nd has been postponed.

Pacific Division Electrical Supply Jobbers Association

The Pacific Division of the Electrical Supply Jobbers Association has postponed the Mt. Rainier meeting from August 12th, 13th and 14th to September 9th, 10th and 11th, the place to be Portland.

The Northwest Electric Light and Power Association Convention convenes in Portland September 11th, 12th and 13th and it was deemed advisable to hold the Jobbers' meeting at about the same time so that members could cover both meetings.

BUILDERS OF THE WEST—XXXIV

HENRY E. HUNTINGTON

Upon the principle that an electric railway once established development was sure to follow even in a hitherto undeveloped and barren country, the Pacific Electric Railway in Southern California has demonstrated to the world what an enduring faith can accomplish. In these days when electric traction companies are struggling to meet the tremendous advances in cost of operation with meager increase in fares, it is well to revert in memory to a score of years ago when they meant so much to the growing life and development of the West. To Henry E. Huntington, empire builder and discerner of the greatness of the West, this issue of the Journal of Electricity is dedicated in appreciation of his enduring service to the West.

Foreign Trade Club of San Francisco

The real inside of present conditions in Russia and the economic situation existing there was presented by William Edward Smith, late of Petrograd, Vladivostok and Harbin, who addressed the meeting of July 17th on the subject of "Russia's Needs — Our Opportunities." Mr. Smith represented some of America's largest manufacturers abroad and lived in Russia forty-five years, being acquainted with that country's leading diplomats and merchants. In addition Eugene K. de Witt spoke on the subject, "Persia—a Wonderful American Opportunity." Mr. de Witt resided in Persia five years and was there during the Shuster episode.

Joint Meeting of San Francisco Societies

A joint meeting of the San Francisco Sections of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Chemical Society was held at the Engineers' Club, Tuesday, July 23, 1918 at 7:30 p.m., to hear Alfred D. Flinn, secretary of the Engineering Council, speak on the subject, "Cooperation Among Engineers and Engineering Societies." Mr. Flinn is working out very interesting plans along these lines, and he spoke with authority on the work of the Engineering Council, the United Engineering Society and the Engineering Foundation. There is a suggestion, originating in San Francisco, that a "Joint Committee" be formed to foster closer cooperation among the local sections. This and other plans were considered by the meeting at large after Mr. Flynn's address.

Joint Portland Meeting

More than 100 members of the Northwestern Society of Highway Engineers, the Oregon Society of Engineers, the Portland local association of the American Society of Civil Engineers attended a convention of Northwestern engineers held in Portland recently.

A detailed discussion of the merits of changing the title of county surveyor to that of county engineer and combining his duties with that of the county roadmaster took up the afternoon. The meeting went on record as advocating this step and of making the county engineer an appointive office instead of an elective one. Since the office is closely connected with the county courts, it was was decided to make the county courts the appointing body which would select the county engineer. This recommendation will be embodied in a bill to be presented to the State Legislatures.

The engineers were advised to establish a clubroom in Portland by Orrin E. Stanley, president of the Oregon Society of Engineers. Mr. Stanley emphasized the value of cooperation between members of the profession, which, he said, could be best obtained by bringing the membership into closer fellowship through a common meeting place.

Announcement was made that Albert Flynn, of New

SPECIAL ATTENTION is called to the announcement of the postponement of the Fresno Meeting of the California Electrical Cooperative Campaign from Aug. 2nd to 30th as noted above. The action was taken in response to the requests of many who would count this a vacation period and word of the change was received in this office as the last forms were going to press.

York City, an engineer who is touring the country with a view to consolidating the various engineering societies into one large association, would be in Portland July 26 and 27, and it was planned to hold a meeting with him at the Multnomah Hotel on one of these dates.

Hereafter professional engineers in Oregon, Washington, Idaho and Montana may be required to register and pass the requirements of an examining board, if legislation which will be introduced by the engineers at the next legislatures is passed. Many engineers now practicing in the Northwest are not properly fitted for their work, it is said. This bill will keep counties from electing engineers who are not qualified for their work. An address on this question was made by R. H. Thompson, consulting engineer of Seattle, Wash.

Oregon Commonwealth Conference

The tenth annual Commonwealth Conference held under the auspices of the University of Oregon took place Friday and Saturday, July 12th and 13th in the Elizabethan room of the Imperial Hotel, Portland. Problems of general state interest as well as special engineering subjects were considered at the various meetings. The development of idle lands, power and drainage opportunities, the housing problem and rate questions from the standpoint of the railroads were among the subjects taken up.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—Comfort A. Adams, Harvard University.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman—Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section
Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Secretary—W. D. Scott, Portland, Ore.
Meetings—Monthly.

Denver Section
Chairman—Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section
Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section
Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section
Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch
President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Happold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch
Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch
Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College
Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch
Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman—S. E. States, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393 College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
Chairman—W. Creighton Peet.
Secretary—Harry C. Brown, 110 West 4th St., New York.
Executive Committeemen-at-Large—W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggar, Portland.

British Columbia Ass'n Electrical Contractors and Dealers
President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver, B. C.
Meetings—First Tuesday of each month.
Aug. 16th-17th—Annual meeting—Victoria, B. C.

California Ass'n of Electrical Contractors and Dealers
President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco
President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings—Monday, 12:15; Jules Sutter Cafe.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Canter St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers
President—A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers
President—J. H. Sroufe, Jaggar-Sroufe Co., Portland.

Utah Society of Electrical Contractors and Dealers
President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers
President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—W. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

National Electric Light Association
President—W. F. Wells, Edison Elec. Illuminating Co., Brooklyn.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.

Nevada Section, N. E. L. A.
Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.
President—Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.
Secretary—A. H. Halloran, Journal of Electricity, Crossley Bldg., San Francisco.
Meetings—Annually, in April.

Portland Section, N. E. L. A.
Chairman—H. H. Schoolfield, Pacific Power & Light Co., Portland.
Secretary—F. H. Murphy.

Illuminating Engineering Society
President—George A. Hoadley.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.
Meetings—First Tuesday each month.

New Mexico Electrical Association
President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association
President—H. C. Morris.
Secretary—H. S. Cooper, 408 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League
President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
President—R. E. Fisher, Pac. Gas & Elec. Co...
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—C. A. Blair, Los Angeles.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dodson, 835 Howard St., San Francisco.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

National Officers
President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
Meetings—Quarterly.
Thursday luncheo have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President—Orrin E. Stanley, Box 973, Portland, Ore.
Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
President—B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual Meeting: October.

Idaho Society of Engineers
President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President—George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section
Secretary—Norman C. Thorne.

Foreign Trade Club
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual Next convention—September. 1918, in Los Angeles.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

THE NEW ELECTRIC SIGNS ORDER IN CALIFORNIA

To economize in the use of electric power in Northern and Central California and to conserve as much energy as possible for war industries, State Power Administrator H. G. Butler issued a drastic order prohibiting during August and September, except on Saturdays, Sundays and legal holidays, the use of electricity for signs or display of any kind. He ordered that, beginning August 1, breweries shall be furnished one-half their average monthly supply of electricity for power, urged city officials to lower street lighting to the minimum of public safety and directed street railroads to reduce their mileage to bare necessity.

Text of First Order

The first order reads:

Effective during August and September, except Saturdays, Sundays and legal holidays, no electrical energy shall be used:

(A)—For advertisements, notices, announcements, or signs designating the location of an office or place of business or the nature of any business;

(B)—For external illumination for ornamentation of any building;

(C)—For lights in the interior of stores, offices or other places of business, when such stores are not open for business.

(D)—For excessive street lighting intended for display or advertising purposes.

Text of Brewery Order

The brewery order reads:

(1)—Effective at once and until further notice, no new brewing business shall be taken on;

(2)—Effective August 1, 1918, the monthly consumption of electric power for present brewery business shall be reduced to not more than 50 per cent of the average monthly amount delivered during the last three months;

(3)—Power companies shall report to this office the power consumed during April, May and June, 1918, and shall hereafter report the monthly consumption of each brewery served by them;

(4)—Whenever two or more breweries find that economy would result from using in one brewery the allotments of power as provided for by this order to two or more breweries, then upon application to the Power Administrator and on a permit therefor, such brewers may use the aggregate allotments of power to their respective breweries at one or more breweries operated by them, provided the amount of power so used shall not exceed the amount of power permitted to be used by all such breweries when operated separately.

Butler's orders were issued after a conference with utility representatives. They affect all territory in California north of Merced county in the San Joaquin valley and north of Monterey county on the coast. At the same time he and the utility men agreed on a card to be distributed to all merchants and business men, appealing to them to save power for war industries.

NATION-WIDE LIGHTLESS NIGHTS ORDER

Resumption of "lightless nights," inaugurated last winter to save fuel, became effective Wednesday, July 24th.

All outdoor illumination, with the exception of necessary street lighting, is to be discontinued after that date on Monday, Tuesday, Wednesday and Thursday of each week in the New England States, New York, Pennsylvania, New

Jersey Delaware, Maryland and the District of Columbia each week in the remainder of the United States.

The regulations under which the "lightless nights" will be carried out are the same as those put into force by the fuel administration last winter, with the exceptions of the nights designated. Street lighting will be reduced to that necessary for public safety. Roof gardens and outdoor restaurants and motion picture theaters are not affected by the order.

INCREASED POWER RATES

Northern California Power Company—

The Northern California Power Company has asked the Railroad Commission for authority to increase its rates for electricity in Shasta, Tehama, Glenn, Colusa, Butte, Trinity and Yolo counties, basing its application on the increased cost of materials, supplies and labor. The company also cites that the Pacific Gas & Electric Company, with which it competes, was granted an increase lately and that the Northern California Power Company should be treated similarly. The The company wants particularly to add a surcharge of 1 cent a kilowatt hour for energy sold for lighting service, two-tenths of a cent a kilowatt hour for energy sold for power service and 10 per cent of monthly bills for power for municipal lighting.

Sierra and San Francisco Power Company—

The Sierra and San Francisco Power Company, selling electricity to consumers in Calaveras, Stanislaus, San Joaquin, Contra Costa, Tuolumne, Santa Clara, San Benito and San Mateo counties has applied to the Railroad Commission for authority to increase its rates. Shortage of water necessary to develop electric power, increased cost of fuel oil and the advance in the cost of labor are given as the three reasons why the company needs more revenue. The company leaves it up to the commission as to what increase in rates should be granted.

Western States Gas & Electric Company—

The Western States Gas & Electric Company filed a similar application with the commission asking for authority to add to its rates in the Stockton division. This embraces territory in San Joaquin, Sacramento, Amador, Calaveras and El Dorado counties.

Southern California Edison Company—

Application has been made by the Southern California Edison Company for an increase of rates throughout its territory, which embraces most of the country south of the Tehachapi.

Vacaville Water & Light Company—

The Vacaville Water & Light Company filed an application with the Railroad Commission for authority to increase its rates for water and electricity in the town of Vacaville, Solano county. The company says that its flat rate contract for the purchase of electricity from the Pacific Gas & Electric Company has been canceled by the order of the Commission raising the Pacific Company's rates. The discontinuance of the old contract necessitates the purchase of 122 new meters by the Vacaville company.

HIGHER FARES IN THE NORTHWEST

Tacoma—

An ordinance has been passed by the city of Tacoma which provides for seven cent cash fares in any part of the city on any of the street car lines. Fifteen tickets for one dollar to be good anywhere in the city and five cent cash fare on the municipal line outside of the city limits also universal transfers between Tacoma Railway & Power Company and the municipal lines are provided for. This action comes about as the result of findings made by a special committee of twenty appointed from the various branches of industry and civic life in the city. On transfers, the city is to pay the Tacoma Railway & Power Company three cents for every transfer from the company lines taken up on the city line and the company is to pay the city three cents for every transfer it receives from the municipal line.

Seattle—

The city council of Seattle has voted to grant such relief in the way of increased fares or other concessions as will enable the Puget Sound Traction Light & Power Company to increase its earnings sufficiently to give the city adequate service and better pay and conditions for its trainmen. The vote was to the effect that the company shall be allowed such increase in revenue as will bring in the same per cent of earnings as shown in 1913 to 1917 inclusive. The books will be audited for this purpose under supervision of the city.

FINANCING WAR POWER PLANTS IN THE EAST

Plans have been made to ask Congress for $200,000,000 to finance the erection of huge electric central power plants in various parts of the United States to meet the needs of the country's war industries, according to a statement issued recently by William Potter, Federal Fuel Administrator for Pennsylvania.

The proposed legislation is in line with the efforts of the National Fuel Administration to save coal, transportation, and supply of electric power.

Mr. Potter said the territory most affected embraces Pennsylvania, New Jersey, New York, eastern Ohio, northern West Virginia, and indirectly New England.

FURTHER DEVELOPMENT OF NIAGARA

Acting under orders from the Secretary of War, Robert J. Bulkley and Brig. Gen. Charles Keller, of the Corps of Engineers, have been exercising a general supervision over the supply of electrical power in that portion of western New York in which Niagara Falls hydro-electric power is used.

A TELEPHONE AND OBSERVATION STATION

One of the many ways in which electricity and electrical men are serving in the great War. This is an observation post in a dug-out with telephone connections to headquarters for the purpose of directing gun fire.

Under war conditions the power supply falls short of the demand by about 200,000 horsepower, which amount is not based on new industries but is determined as the amount of power which could be absorbed by the industries now operating, were such a supply available.

Some of this shortage will be relieved by the proposed enlargements of the steam plants of the Buffalo General Electric Company and the Niagara, Lockport & Ontario Power Company. Additions to these two plants will aggregate 62,000 horsepower. By means of a further development by the American hydro-electric companies at Niagara Falls their existing supply of power, amounting to about 250,000 horsepower, will be increased by about 100,000 horsepower.

ROYAL DUTCH SHELL COMPLETE PIPE LINE

The completion of his $7,500,000 oil pipe contract in Oklahoma for the Royal Dutch Shell interests is indicated in a brief dispatch from Wynn Meredith announcing commencement of oil pumping to the new oil refinery at Wood River near St. Louis, a distance of nearly 600 miles.

This pipe line built by Sanderson and Porter, California engineers for the Roxana Petroleum Company, the Royal Dutch subsidiary in the Mid-Continent oil fields, is perhaps the largest oil pipe line undertaking in recent years and links the Healdton and Cushing oil fields to the St. Louis market. Ten-inch steel pipe was laid and the latest type of Diesel engines with steel oil pumps good for 900 pounds pressure to the square inch are employed. In spite of delays in delivery of pipe and machinery because of war conditions the work was executed in record time and conforms to the high standard of design and workmanship of the California pipe line built by the same engineers.

MILWAUKEE ELECTRIFICATION

Electrification of the lines of the Milwaukee Railroad in Washington is proceeding at such a rapid rate that the electric locomotives are expected to be running into King street station, Seattle, by July 1, 1919. C. A. Goodnow, vice-president of the Milwaukee road, announced recently upon his arrival at Seattle from Chicago that transformation of the lines between Othello, Seattle and Tacoma from steam to electricity had proceeded under such favorable circumstances that service may be expected in less than one year. The substations, of which there are eight, are nearing completion and by August 15th will be ready for the electrical apparatus. Each of these stations with its three bungalow homes for operators, when the machinery is completely installed will cost approximately $200,000. The trolley and transmission poles between Cle Elum and Tacoma have been set and are now ready for the wires. The remainder of the poles from Doris to Cle Elum and between Black River Junction and Seattle will be set by October 1st. The trolley, transmission and other copper wires will be drawn at a new wire mill which has been constructed by the Anaconda Copper Company at Great Falls, Montana, directly from copper refined at the works of the Anaconda Copper Company.

Locomotives will be delivered during the spring of 1919 and will receive a tryout in the electrical zone of Montana before being brought to the coast. They will cost about $200,000 each. The total cost of the electrification between Othello and Seattle and Tacoma will be about $9,500,000. The government desire for conservation of man and motive power will be automatically carried out, as the electric engines to be used in the service will release forty steam locomotives, fuel cars, oil and water stations, and the tonnage per train doubled at the same time. Upon completion of the electrification into Seattle and Tacoma, but 220 miles will remain to complete the electrification of the entire line from Harlowtown, Montana to Puget Sound. The Milwaukee will then have nearly 1000 miles of continuous main line under operation.

CHANGES AND BEGINNINGS

A New Factory—

Work of constructing the factory of the American Line Material Company at the southeast terminus of the St. Paul & Tacoma Lumber Company yards in Tacoma has been about completed according to Gilbert Buckingham, manager of the new enterprise. Manufacture of cross arms, insulators and wooden conduits are purposes of the plant which is financed entirely by local capital. About 30,000 feet of lumber will be used daily after the enterprise gets to running at full capacity and 20 or 25 men will be employed.

Pacific Power & Light Company Moves—

The Portland Gas & Coke Company, the Pacific Power & Light Company and the Walla Walla Valley Railway Company have transferred their general offices to the Gasco Building from the Spalding Building, Portland, Oregon.

New Orleans Office—

The New Orleans office of the Edison Storage Battery Supply Company has been moved from 201 Zaronne street to larger and more commodious quarters in the Maison Blanche Building, Room 911. Mr. D. B. Mugan is District Sales Manager.

PERSONAL ITEMS

Western Electric Incorporation—

Announcement is made of the incorporation of the International Western Electric Company, Inc., with offices at 195 Broadway, New York. The new organization will take over the Western Electric Company's export and foreign business. The officers of the new company are as follows: H. B. Thayer, president, H. A. Halligan, vice-president, Gerard Swope, vice-president and general manager, R. H. Gregory, comptroller and secretary, and J. H. Johnston, treasurer. W. E. Leigh will be assistant foreign manager with J. J. Gilbert as export sales manager.

Detroit Sales Manager—

The appointment of Mr. L. D. Calhoun as assistant sales manager has been announced by the Square D Company, Detroit, manufacturers of electrical safety switches.

AUSTRALIANS BUY AMERICAN ELECTRICAL GOODS

American electrical goods, always well liked in Australia, have been in much greater demand there since the war started than ever before, according to a report published recently by the Bureau of Foreign and Domestic Commerce, Department of Commerce, under the title of "Electrical Goods in Australia," by R. A. Lundquist.

No such extensive use is made of electricity as in the United States, in spite of the fact that Australia has no real poverty and a large percentage of people who can afford to live well, but continuous propaganda and educational work will do wonders in the end. At present, Australians do not have the same desire to take up the semi-luxuries in electrical appliances that Americans of sufficient means will not do without.

ANNUAL REPORT, NORTHERN STATES POWER COMPANY

After sustaining a difficult year without loss in net earnings, officers of Northern States Power Company are looking for better results in 1918, as stated in the annual report just issued. While the company materially increased its business, increased coal and labor costs and higher taxes made serious inroads on its net earnings last year. Regarding conditions at present the report says:

Earnings for 1917 and 1916 compare as follows:

	1917	1916
Gross Earnings	$7,154,508.89	$6,087,153.16
Operating expenses and taxes	3,764,728.39	2,745,496.26
Net earnings	3,389,780.50	3,341,656.90
Interest charges	1,709,837.74	1,593,127.79
Balance	1,679,942.76	1,748,529.11
Preferred dividends	916,011.05	740,236.39
Balance available for amortizations, depreciation and Common dividends	763,931.71	1,008,292.72

LATEST IN EVERYTHING ELECTRICAL

(The value of the CO_2 test in fuel saving which is at the base of the bonus systems suggested by the U. S. Fuel Administration is simply pictured in a chart recently gotten out by an instrument company. For dealers in auto lamps, a new cabinet has been designed. An electric smelting furnace, a safety switch panel and various other recent advances are described below.—The Editor)

FOR DEALERS IN AUTO LAMPS

Few auto lamp dealers have found it possible to keep their stock in any kind of attractive order. So long as the original carton container was the most practical means of carrying the lamps in stock, the stock was certain to look ragged and confused. Constant handling was bound to result in torn and soiled cartons, and in a mixed-up stock. There was a lot of breakage to take the fun out of the profit.

To remedy this unsatisfactory condition among their dealers, an all-steel cabinet is now being supplied at wholesale cost by the American Ever Ready Works of National Carbon Company, Inc., Long Island City, N. Y., as illustrated above.

Not only does this Eveready cabinet display the lamps to customers in most attractive and sales-pulling show, but it holds a stock of 400 lamps in one-half the space it would

A convenient cabinet

occupy in the original boxes. No cartons are used in this cabinet—just five drawers, each containing a tray punched with holes wherein the lamps are placed.

Any style lamp can be found instantly. The various lamp styles are illustrated in actual size on the outside of the cabinet drawer with lettering thereon showing the new catalogue number, candle power, voltage, base and its size and type. When a drawer is opened, there are rows of lamps, each equal to unit package quantity, extending from front to rear of the drawer; and each row of lamps is of exactly the same style as pictured at the head of the row on the outside. To avoid accident, the drawers are constructed so they cannot be pulled from the cabinet.

As this Eveready Cabinet is a permanent steel fixture, only such lamps as are in daily demand have been lithographed on the drawers. There are several blank illustrations of each size which can be utilized when extra space is desired for popular styles; or they may be lettered to describe any special lamps which it may be desirable to carry, thus permitting flexibility of stock and assortment to meet the needs of dealers in various parts of the country.

In size, the Eveready Cabinet is 22½ inches wide, 16¾ inches high and 12 inches deep—easily fitting in place on the dealer's counter or shelves. The sign at the top is collapsible for convenience in shipping.

THE MONEY LOST UP A CHIMNEY

A handy and useful chart has been developed by the Uehling Instrument Company, 71 Broadway, New York, which is of unusual interest and value at the present time when the coal problem is so important, for it enables anyone to quickly and closely estimate the money now being lost up almost any chimney due to low CO_2.

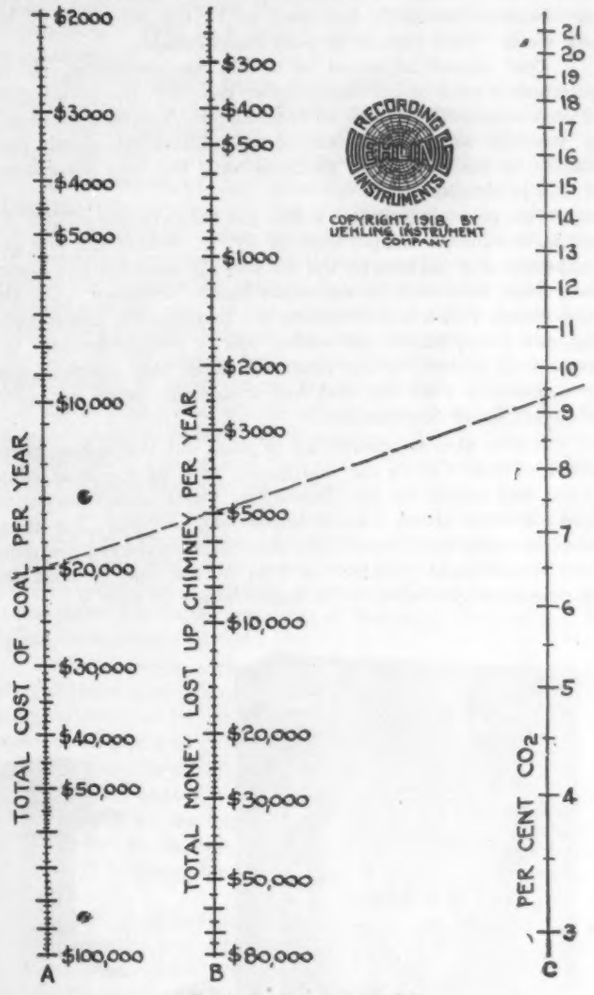


Chart showing loss of CO_2

Simply connect the percentage of CO_2 (shown in Column C) with the money now being spent per year for coal (shown in Column A) and the intersection of the connecting line with Column B immediately gives the dollars rolling out of the chimney in the form of heated gases.

Example: If $20,000 is spent per year for coal burned in a furnace whose average CO_2 registers 9.3%, what is the approximate money lost up the chimney per year?

Solution: Connect the $20,000 (Column A) with the 9.3% (Column C), as indicated by the dotted line drawn drawn across this chart, and the intersection with Column B shows the approximate yearly loss to be $5000.

The object of this chart is to show that a high percentage of CO_2 is most desirable. To be sure, even where the CO_2 is as high as 21%, the theoretical maximum there is a loss because in the average power plant the flue gases leaving the boiler have a temperature as high as 500 or 600° F. Loss therefore is inevitable unless a blower is used for exhausting the gases and some sort of interchange system is installed for either heating the feed water or preheating air and leading it under the grate.

It is significant that most of the large power plants of today have adopted the CO_2 instruments that record automatically and continuously. The reason for this is to keep constant tab on the workers in the boiler room and the efficiency of combustion. The recorder may be placed at any convenient distance from the boiler in the office of the chief engineer, owner, manager or superintendent, while an auxiliary CO_2 indicator is placed on the boiler in front in full view of the fireman. The function of the indicator is to keep the fireman constantly informed as to the efficiency of his own work. This feature is most commendable.

Coal cannot be saved by a CO_2 machine alone. If no attention is paid to the indicator or recorder, the installation of such apparatus borders on foolishness. The records should be carefully watched and studied and adjustments should constantly be made in firing methods until the best percentage of CO_2 is obtained.

This chart is based on a flue gas temperature of 600° F., and an outside air temperature of 60° F. Where the flue gas temperature is higher, or the outside air temperature lower, the money loss will be correspondingly increased. On the other hand, with a higher outside air temperature and a lower flue gas temperature, the money loss is proportionately decreased. Further, in the construction of this chart, it has been assumed that the coal has a calorific value of 14,500 B.t.u. per lb. of combustible.

It may also be interesting to point out that where there is only 3% of CO_2 in the flue gases, 76% of the heat value of the coal passes up the chimney as waste under the conditions outlined above. It is impossible, however, for these gases to contain as low as 2%, because it would require more than the original quantity of heat in the coal to heat the enormous surplus of air to a temperature of 600° F.

LOW TENSION DEAD FRONT SWITCH PANEL

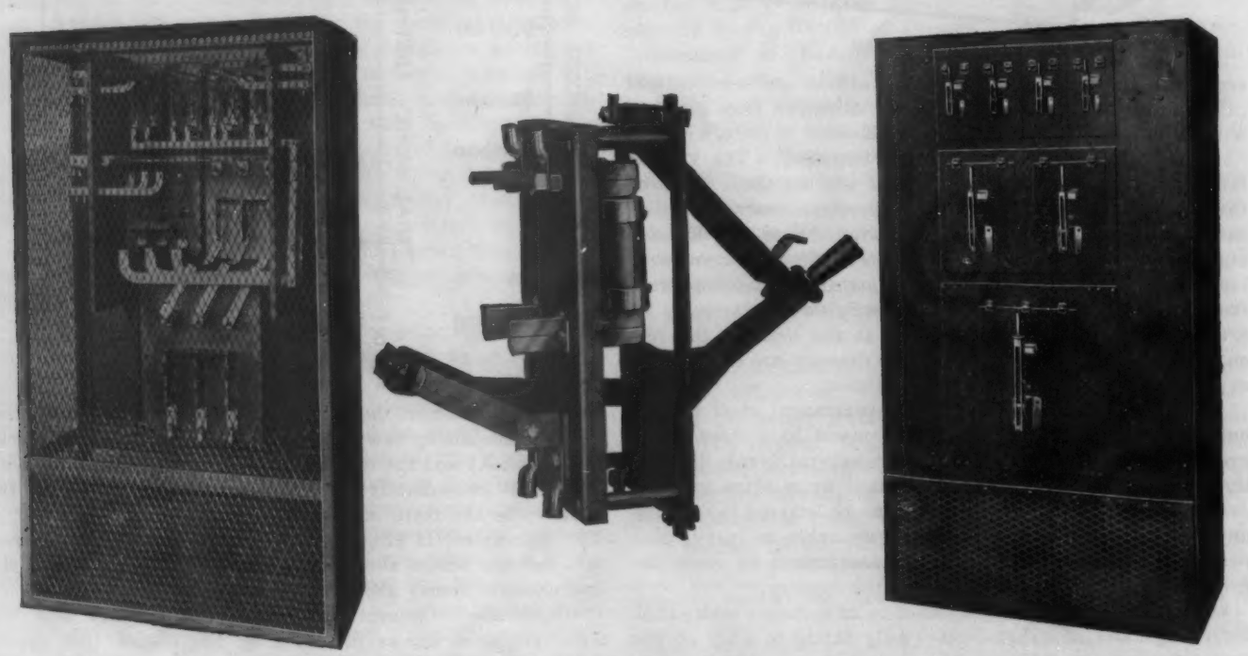
The illustrations typify a line of dead front panel switches made by the General Electric Company of Schnectady. These represent a highly important safety first development. Primarily the panels are intended as distributing panels for light and power and for generator and feeder panels for small lighting and power plants. Due to their high factor of safety they are especially valuable in factories where the switchboards are operated by inexperienced or careless employes.

A switch-unit consists chiefly of standard knife switch and fuse clip parts, mounted on a slate base and supported by iron studs at the back of a sheet steel panel. The steel panels are 3/16 inch thick and their other dimensions are graded so that they present a uniform appearance even when several sizes are mounted together.

The operating handle has the same general appearance as an oil circuit breaker handle and is so arranged that it is in the vertical position when the switch is "on" and at an angle of 60 degrees with the panel when the switch is in the "off" position. The operating link passes through both the steel panel and the slate base and transmits the motion from the handle to a lever attached to the cross bar of the switch.

The steel panel of the switch unit is provided with a sheet steel door which is hinged at the top, allowing it to open upward as far as the stop on the operating handle behind which it is mounted. This door gives access to the fuses from the front panel but cannot be opened while the switch is "on." When this door is open, the switch cannot be closed. Fuses can be inspected or replaced at any time, but the operator cannot come in contact with the live current carrying parts as the fuses are on the load side of the switch, and the fuse clips must be dead before the fuse compartment door can be opened. The switch can be locked in the "off" position by an ordinary padlock. The capacity of the switches is limited by the sizes of 250 and 600 volt enclosed fuses as approved by the National Board of Fire Underwriters. The current ratings range from 60 to 600 amperes.

The panel frame is built of riveted angle iron, and the current carrying parts back of the panel are enclosed in expanded metal.



Single unit of the "Dead Front Panel" and front and rear views, showing safety features

BOOKS AND BULLETINS

An Esterline Pamphlet

The Esterline Company, represented by C. F. Henderson, Call Building, San Francisco, has issued an interesting leaflet showing how Esterline graphic meters are used to show the operating performance of motors.

Mine Equipment

C-H Equipment for Mines are referred to in a new pamphlet just issued by The Cutler-Hammer Manufacturing Company of Milwaukee and New York. The equipment illustrated and described includes sectional charging equipment for miners' lamp batteries, as well as equipment and control apparatus for mine locomotives. A mine installation of automatic motor driven pump control is also shown and the large saving effected by this electric apparatus over the previous steam pumps is given. Reference is made to a complete line of C-H starters, rheostats and controllers for general mine motor applications.

A Business Building Bulletin

Under the title "Business Building Bulletin, the Beardslee Chandelier Manufacturing Company of Chicago has just issued a 25x36-inch broadside illustrating 36 types of popular-priced direct and indirect lighting fixtures for all purposes. This broadside offers a 24-hour service on all orders for standard lighting fixtures. A new scale of discounts is also announced by this company.

Standard Gas & Electric Company

Standard Gas & Electric Company earned a surplus of $111,207 for the year 1917 after the payment of interest charges, 6% preferred stock dividends and amortization, according to the annual report just issued. Net income for the year was $1,566,051, compared with $1,664,199 in 1916. In addition to these earnings, which are from returns on securities owned, the company had $100,000 income from other sources in 1917 compared with a profit of $311,857 on bonds called for redemption in 1916. The report as customary analyzes the company's affairs in detail.

The organization had 393 men in national service January 1st, including Lieutenant-Colonel H. M. Byllesby, Brigadier-General George H. Harries, Major W. R. Thompson, and Second Lieutenant A. S. Cummins.

Subsidiary companies now serve 386,810 customers, a gain of 39,164 during the year. Communities served aggregate 439 with an estimated population of 2,901,000.

Spontaneous Combustion of Coal

So many inquiries reach the Bureau of Mines, Department of the Interior, concerning the spontaneous combustion of coal, that the bureau has issued the following general statement on the subject:

It is to be recommended that coal should be stored in small quantities as near to the point of consumption as possible. Small coal piles rarely ignite from spontaneous combustion. Coal should be stored near the point of use to avoid re-handling, extra transportation, and the degradation of size which follows each re-handling. If large storage piles are necessary, certain general principles must be borne in mind. The generation of heat is the result of slow oxidation of the coal surface. The oxidation is much more rapid from freshly mined coal or from freshly broken surfaces. The oxidation rate increases rapidly with increased temperatures. Different coals have different ozidation rates. These facts lead to the following recommendations:

Where there is choice of coal to be stored, that having the lowest oxidizing rate should be chosen, if known.

Between two coals, that which is least friable, and therefore which presents the least total coal surface in the pile, should be selected.

The method of handling should be such as to produce the least freshly broken coal surface.

The coal should be as cool as possible when piled. Piling warm coal on a hot day is more likely to produce spontaneous combustion.

The coal must be kept from an extraneous source of heat.

Alternate wetting and drying of coal during piling is to be avoided if possible.

The fine coal, or slack, which furnishes the larger coal surface in the pile, is the part from which spontaneous combustion is to be expected. Piling of lump coal where possible is therefore desirable.

In the process of handling, if the lump coal can be stored and the fine coal removed and used immediately, the practice prevents spontaneous combustion in coals which would have otherwise given trouble.

The sulphur content of coal is believed by many to play an important role in spontaneous combustion. The evidence on this point is still conflicting, but to play safe, it is advisable to store only one kind of coal in a pile.

The ground on which a coal pile is built should be dry.

The foregoing recommendations are all derived from the factors affecting the heating of coal.

There should be no spontaneous combustion, whatever the heating rate, provided the heat is carried away as rapidly as produced. This fact brings about the following recommendations:

Coal piles should be so made that there is ready movement of air for ventilation throughout all parts of the coal pile. This is the condition when the entire pile is made of coarse lump coal. With ordinary coal piling this is difficult.

The surfaces of coal piles should be so exposed as to allow the pile to cool; or else the coal should be so stored that air circulation within the pile is very small. When the air circulation is reduced to a minimum, as in an air-tight bin, with no openings in the bottom, the oxygen of the air is soon removed and the mass of the coal lies in an inert atmosphere, except for small local circulation near the surface. Air-tight bins are usually impracticable, but the following practice is recommended to approximate these conditions:

In making a coal pile of mixed sizes, the coal should be so handled as to make a homogeneous pile and prevent the segregation of coarse and fine coal. This frequently determines the most desirable machinery for unloading coal.

It is a common practice to limit the height of a coal pile, this for two reasons: A pile too high crushes the lower layers of coal, producing more fines; the larger the pile the less heat-dissipating surface there is exposed in proportion to the heat generating capacity of the pile. Twelve feet in height is a common limit.

Whatever precautions are taken in choice and handling of coal, provision should be made for keeping track of the temperature rise in a coal pile and for rapid re-handling of portions of a pile in case of excessive heating.

To keep track of the temperature of coal piles, it is recommended that half-inch iron pipe be driven vertically into the pile at distances of fifteen or twenty feet apart. A maximum thermometer lowered into the pipe to varying depths will indicate the temperature of pile opposite the thermometer.

A survey of the pile and a survey of the temperature of all parts of the pile should be made twice a week during the first three months after the pile is made, and once a week thereafter until the pile has evidently ceased to heat. As soon as any portion of the pile reaches a temperature of 150°, provision should be made for removing that portion of the pile. Actual removal need not begin until the temperature has reached 180°, but at these temperatures the rate of oxidation is dangerously rapid. The object of re-handling the coal is to allow it to cool below a dangerous temperature. Any method of re-handling which does not allow of cooling will only transfer the difficulty from the old pile to the new one. It is usually useless to employ water in an attempt to cool a coal pile.

Lack of provision for rapid reloading, cooling, and re-piling of coal is the cause of serious loss from spontaneous combustion.

NEW ELECTRICAL DEVELOPMENTS

(Car service in the Canadian Northwest has been resumed after an adjustment of labor troubles. Seattle's application for permission to issue bonds to finance a Skagit river project has been unfavorably reported and a committee has gone to Washington in its behalf. Irrigation plans, the exchange of power between power companies and applications for government aid in new hydroelectric power developments represent war phases of the situation in the Pacific Central and Southwest districts.—The Editor.)

THE PACIFIC NORTHWEST

YAKIMA, WASH.—The Valley Electric Supply Company has been succeeded by A. J. Gladson.

NEW WESTMINSTER, B. C.—Construction has started on a modern steel plant. Electric furnaces will be used for the conversion of scrap.

TONASKET, WASH.—The Okanogan Valley Power Company has started construction of a new power line from Riverside to Tonasket in Okanogan county, Washington.

SEATTLE, WASH.—The Vulcan Manufacturing Company has been awarded a contract by the city for furnishing three girder spans for the municipal elevated railway at $14,980.

SEATTLE, WASH.—The Todd Dry Dock Company, 1801 16th avenue Southwest, is to erect a two-story heavy timbered power house and storehouse to cover 100 x 50 feet and cost $9,000.

EVERETT, WASH.—The city council is considering plans for the early construction of a power station in the upper Sultana river district. Burns & McDonnell, Kansas City, Mo., are engineers.

WARDNER, IDAHO.—Engineers and surveyors have established camp at Beeler and are at work on the new Pine creek railroad, preparatory to the letting of contracts for the actual construction work.

SEATTLE, WASH.—Parker & Banfield of Portland have been awarded a contract at $5260 for constructing the generator plant at the Washington end of the Interstate bridge and work will begin at once.

PORTLAND, ORE.—The Portland Railway and Power Company has a permit to make repairs to its one-story power house at Nicolai and Sherlock streets, to cost $2,000. Otis Elevator Company is to make the repairs.

NEW WESTMINSTER, B.C.—The city light and power department of New Westminster, B. C., reports a revenue of $35,000 for the first five months of 1918, compared with $34,258 for the first five months of 1917.

VANCOUVER, B. C.—Street car service is again normal in British Columbia cities following the settlement of the electrical workers and carmen's strike. The carmen are to receive a minimum of 40 cents an hour and maximum of 51 cents.

SALEM, ORE.—Rules and regulations governing applications for a franchise to build dams and booms and to drive and catch logs and other timber products under the provisions of chapter 128, laws of 1917, have been adopted by the public service commission.

WENATCHEE, WASH.—County commissioners have granted a franchise to the Chelan Water Power Company for construction of a pole line from Entiat to Maple Creek. The line will be a part of the equipment of the new power plant to be constructed at Chelan.

SEATTLE, WASH.—United Railway & Logging Supply Company made a bid of $6,611 each for furnishing 20 double-truck steel cars and $4000 each for six single truck steel cars for the municipal railway. Birton R. Stare Company bid $11,590 each for the double truck and $6,697 each for the single truck cars.

ANDERSON, CAL.—The biggest pump ever seen in this county arrived here for the Northern California Power Company. It weighs 8000 lbs. and takes six horses to haul it. It will pump 20,000 gallons per minute and requires a 200 horsepower motor to operate it. The water will be pumped out of Baldwin Creek into the Coleman ditch.

SEATTLE, WASH.—King County commissioners have leased to the Northwest Motor Company industrial tracts six and seven on the Duwamish Waterway. The company will erect an iron and steel foundry in which will be installed an electric steel furnace, iron cupola and overhead traveling crane. Over 100 molders and helpers will be employed.

HOQUIAM, WASH.—The Lamb Machine Company is to erect a $50,000 steel plant to be operated in connection with its machine shop. An electric furnace of two tons per heat capacity and from 3 to 6 heats per day is to be a part of the equipment. Five hundred and fifty horsepower will be used. The plant will have a capacity of ten tons of steel and from five to six tons of iron castings per day.

TACOMA, WASH.—The Continental Pipe Manufacturing Company has bought the equipment and good will of the Pacific Pipe Company, Seattle, the Washington Pipe & Foundry Company, Tacoma, the National Tank & Pipe Company (pipe department), Portland, and the Portland Wood Pipe Company, Portland. Factories will be operated in Portland, Tacoma and Seattle, with general offices in Seattle.

SALEM, ORE.—An important reclamation contract has been arranged between the board and the Jordan Valley Land & Water Company. The contract covers about 30,000 acres in the Jordan valley, in Malheur county. Already the Antelope flat reservoir and a feed canal leading from Jordan creek have been partially constructed, and the company, under the contract, will complete the canal so that it will have a capacity of 127,000 acre feet.

SPOKANE, WASH.—Contracts for heating of buildings in the down town district, now held by the Spokane Service Company, a subsidiary of the Washington Water Power Company, the majority of which expired on July 1, are not to be renewed according to notice given to contract holders. Other contracts are to be canceled as quickly as possible. The heating business not having proved profitable to the company is the reason for discontinuing it.

SEATTLE, WASH.—Mayor Ole Hansen and members of a committee of the Seattle city council have gone to Washington, D. C., to press the city's request for authority to issue $5,500,000 in bonds to finance a municipal power project on the Skagit river. The San Francisco sub-committee of the Capital Issues Committee of the Treasury reported adversely on the issue and the mayor appealed to the Washington delegation in Congress. The Senate adopted a resolution by Senator Wesly L. Jones, directing the Capital Issues Committee of the Treasury to send to the Senate all papers and communications relating to the case.

THE PACIFIC CENTRAL DISTRICT

HANFORD, CAL.—Fire destroyed the telephone exchange at Alpaugh. The damage done was partly covered by insurance.

HANFORD, CAL.—A contract has been awarded by the city to the Gamewell Fire Alarm Company for improvements in the municipal fire alarm system.

SALINAS, CAL.—City Engineer D. F. Davies has been authorized to purchase a quantity of 300 candle power electric lights to replace the 600 power electrolier lights now in use.

STOCKTON, CAL.—Western States Gas & Electric Company has recently contracted with the Sperry Flour Mills for supplying additional power for the operation of their plant in the amount of 315 horsepower in motors.

TERRA BELLA, CAL.—All bids for the issue of $150,000 six per cent bonds of the Terra Bella Irrigation District that were offered at public sale were rejected. It is understood that the bonds will be offered again before long.

PORTERVILLE, CAL.—In anticipation that the Railroad Commission will grant an increase of rates to the Mt. Whitney Power & Electric Company, the city officials have asked for preliminary estimates on the cost of installing a municipal light plant.

STRATHMORE, CAL.—San Joaquin Light & Power Corporation has recently completed the construction of a local substation, which will tie in the systems of the Southern California Edison Company and the Mount Whitney Power & Electric Company with its own power lines.

RICHMOND, CAL.—The Richmond division of the Western States Gas & Electric Company reports an increase of 44% in the output of electric energy for the week ended June 29 over the corresponding week a year ago. Total output for the year to date was 18% ahead of last year.

TRACY, CAL.—For the second time the West Side irrigation district leads all the other districts in the State in the matter of premium obtained for bonds. Of the eight bidders entered in the contest, McDonnell & Company of San Francisco was awarded the prize, $3,258 being the premium obtained for the issue of $100,000.

OAKLAND, CAL.—A three-hour strike of the linemen employed by the San Francisco-Oakland Terminal Railways was called off when the company granted a flat wage increase of 80 cents a day. By the agreement made with the company, the men will be paid a minimum of $4.05 for groundmen, $4.55 for drivers and $6.05 for foremen.

SAN FRANCISCO, CAL.—Bids were received by the Board of Works for the construction of the extension of the municipal railway from the western portion of the Twin Peaks tunnel into the Parkside district. The Raisch Improvement Company's bid of $42,000 was the lowest figure for the work. The line will go along Taraval street to 20th avenue.

HAYFORK, CAL.—The State Engineer, having completed a preliminary survey of the Hayfork Valley irrigation project, reports that it is feasible. There are 10,000 acres in the proposed irrigation district. It is calculated that the cost per acre for irrigation water will be $25, surely not more than $30. At least two storage reservoirs are contemplated, possibly three.

STOCKTON, CAL.—Western States Gas & Electric Company is constructing a dam at Twin Lakes to impound 1,000 acre feet of water. The company's output of electrical energy for the Stockton division during the week ended June 28 was 28.3% greater than for the corresponding week last year, and there was an increase of 59% in gas output for the same period.

PLACERVILLE, CAL.—The Western States Gas & Electric Company is to begin immediately work on its million-dollar hydro-electric development project in the high Sierras of El Dorado, Amador and Alpine counties. George Loughland, superintendent of construction, says 100 men will be put to work at Twin Lakes in Amador county, where it is proposed to erect an impounding dam.

FRENCH GULCH, CAL.—I. O. Jillison, general manager of the Hazel Creek Gold Mining Company, whose Crystal Creek power house was burned a few days ago, says the plant will not be restored. French Gulch must look elsewhere for power and light. The nearest connection French Gulch can get with the Northern California Power Company's wires is at the Washington Mine, two miles away.

SACRAMENTO, CAL.—George F. Detrick, newly elected president of the Sacramento Northern Railroad, formerly known as the Northern Electric Railroad, has under consideration the building of new freight terminals which will double the capacity of the warehouses and bean cleaning plant at West Sacramento. The erection of a new warehouse at Shippee, near Oroville, is also being planned.

SAN FRANCISCO, CAL.—J. H. Favorite, chief of the field division in the general land office, has received instructions and regulations for the reclamation of vast tracts of arid land in Northern California and Nevada through irrigation. This is a part of the government's new plan, as announced through the office of Franklin K. Lane, Secretary of the Interior, to prepare land and homes for returning soldiers.

SAN FRANCISCO, CAL.—Negotiations which began over a year ago between I. W. Hellman, Jr., general manager of the Bankers' Investment Company, and M. T. Cook, general manager of the Pacific Coast Division of the Western Union Telegraph Company, have just been concluded in the signing of a 20-year lease for offices and stores in the Bankers' Investment Building, fronting on Market and Geary streets, between Kearny street and Grant avenue.

SAN FRANCISCO, CAL.—Representatives of workmen in the Board of Electricity came before the supervisor's finance committee July 12th with a request that their wages be increased from $5.80 a day to $6.50. At present these men receive a monthly salary which allows them half Saturdays off, all legal holidays and two weeks' vacation with pay. The supervisors finance committee held that the matter is not one for them to settle, but for the Board of Electricity to handle.

WOODLAND, CAL.—A. C. Huston, president of the Yolo Water & Power Company, has announced the completion and permanent operation of the newly installed pumping plant at Clear Lake in Lake county. The new plant has begun to distribute water for 10,000 acres of Yolo county rice fields and 5000 acres of other grain. It has a capacity of 225,000 gallons a day. The new plant was installed as a result of an agreement reached between Ralph P. Merritt, State Food Administrator, and the rimlanders in Lake county.

SUSANVILLE, CAL.—Supervisor Harry E. Wood says that a movement is on foot whereby it is hoped that electric current can be furnished to Big Valley ranchers for lighting and irrigation purposes. The plan is to install power lines from the plant at Fall River Mills to Bieber and Big Valley. There is an almost unlimited power supply falls and if the plan is successful power will be furnished the ranchers for operating irrigation pumps. A vast body of subterranean water lies under Big Valley and this can be used for irrigation if a cheap and efficient means of pumping is found.

SAN FRANCISCO, CAL.—The Public Utilities Committee of the Board of Supervisors recently heard proponents and opponents of the proposed extension of the Municipal Railway from Church street to Twentieth and Illinois streets to serve the Union Iron Works. A report was received from the City Engineer showing the extension would cost $411,198 and could not be completed soon enough to be of any use in the present situation. The report recommended that special service can be arranged by extending the Eleventh-street Municipal line from Potrero avenue over Seventeenth street, along Mississippi, Mariposa, Tennessee and Twentieth streets to Illinois street, at a cost of $178,800.

REDDING, CAL.—The California Oregon Power Company has commenced the construction of a high-tension power line from its southern terminus at Castella to Kennett, where connection will be made with the power lines of the Northern California Power Company. The Castella-Kennett line will be 35 miles long. It is expected that the line will be completed in 60 or 80 days. As making the connection is a war

emergency, all the speed possible is being made. By a combination made through the State Railroad Commission, the California-Oregon will furnish power to the Kennett smelter, relieving the load of the Northern California Power Company, which in turn will deliver its surplus to the Pacific Gas and Electric farther down the valley.

THE PACIFIC SOUTHWEST

REDONDO, CAL.—The Board of Trustees has let a contract for wiring and lighting the municipal pier to E. L. McEwan for $849.36.

SWANSEA, ARIZ.—Considerable electrical equipment will be installed in the new 200-ton milling plant being erected at the properties of the Swansea Mining Company.

LOS ANGELES, CAL.—Announcement has been made by the city that work will commence at once on the municipal pumping stations at Wilmington, Edendale and Carvanza to electricity.

SANTA BARBARA, CAL.—Plans are under consideration by the City Council for the installation of a new ornamental street-lighting system on Anapamu street, from State street to Anacapa street.

TUCSON, ARIZ.—The Tucson Rapid Transit Company will extend its University line from the present terminus at the University campus main entrance along 6th street, Park avenue, to N. Fourth avenue.

NOGALES, ARIZ.—Gov. Soriano has ordered instruments and material for construction of a long distance telephone line between Nogales, Sonora and Tecorp, and between Sahuaripa and Arivache. Work will be commenced at Nogales end of the line and will be rushed to completion.

CLOVIS, NEW MEX.—Municipal bond issue of $50,000 worth of water and light bonds, and $25,000 worth of sewer bonds were sold under competitive bids. The bonds went to Jas. N. Wright Company of Denver, which paid par, accrued interest and a premium of $181.00 besides all attorneys' fees.

SAN DIEGO, CAL.—An ordinance has been adopted by the Common Council granting the Los Angeles & San Diego Railway Company a franchise to construct a street railway over certain streets and places in San Diego, for a period commencing with the granting of the franchise and ending December 31, 1952.

LOS ANGELES, CAL.—The Railroad Commission has approved of the contract whereby the Southern California Edison Company will take all electric current generated by the hydro-electric plant which the Ontario Power Company proposes to build in the San Antonio canyon, taking the water from the San Antonio creek.

LOS ANGELES, CAL.—Southern California Edison Company has made application to the War Finance Corporation for a loan of approximately $20,000,000 to be used, in part, for extensive additions and improvements in its plants and system. It is planned to erect new hydro-electric plants which will develop ultimately 100,000 horsepower.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company estimates its capital expenditures for the next two years at $731,100. Military and naval activities and general development of the country will necessitate enlargement of the plant and extension of facilities. The company has been authorized to issue $1,100,000 bonds.

LOS ANGELES, CAL.—Work has recently been completed and operation inaugurated on the consolidation of the Pacific Telephone Company and the Home Telephone Company with the Southern California Telephone Company. The work, which has taken about 12 months to complete, is estimated to have cost in the neighborhood of $1,000,000.

TERRA BELLA, CAL.—The Terra Bella irrigation district is considering bids for the second allotment of district bonds, in the sum of $150,000, which amount is needed for construction purposes. Around $700,000 has been expended in building the first units of the system. All of the water comes from underground sources and is distributed in steel pipes under pressure.

SANTA ANA, CAL.—War conditions which made it inadvisable and unnecessary for the Pacific Electric to build the proposed extension to Irvine, at a cost of $300,000, have resulted in the company's filing a request with the Board of Supervisors asking that an extension of not more than three years be granted the company, for completing the work under the county franchise.

LOS ANGELES, CAL.—A comprehensive report on the extension of the municipal electric distributing lines into the East Seventh street industrial district and to be served from the city's substation near 9th and Mateo streets, has been submitted by a special committee consisting of Chief Electrical Engineer E. F. Scattergood, Special Counsel W. B. Matthews and Business Agent Burdett Moody.

LOS ANGELES, CAL.—The Capital Issues Committee having approved the project, the Board of Public Works instructed the city electrician, R. H. Manahan, to proceed with the installation of the new Broadway lighting system. It was announced that the Keystone Iron Works, which has the contract, has cast about one-third of the big iron posts. The city power bureau will purchase glass globes and electrical equipment for the system.

SAN DIEGO, CAL.—Contracts for seaplane hangars, landing platforms, quarters and barracks for officers and men at the Naval Air Station on North Island have been awarded and construction will be commenced immediately. The output of electric energy of the San Diego Consolidated Gas & Electric Company during the week ended July 5th amounted to 747,200 kw.hr., which is an increase of 44% over the corresponding week last year. So far this year there is an increase in output of 24.4% over 1917.

THE INTERMOUNTAIN DISTRICT

PUEBLO, COLO.—Banker Steam Motor Company has built an additional unit to its factory, which will be served electrically by the Arkansas Valley Railway Light & Power Company.

MOAB, UTAH.—The city has been without light for several days, a cloud burst having carried away the power dam of the Moab Light & Power Company. Preparations are being made to immediately rebuild the dam.

STERLING, COLO.—Colorado Power Company has purchased five acres of land and will soon commence work on the erection of a plant, estimated to cost $150,000. It will be complete in every respect and equipped with the most modern apparatus for power making. A water system for obtaining soft water will be installed near the city.

BOISE, IDAHO.—Councilman W. D. Stevens was appointed at the regular council meeting to take up the matter of securing ample water at this time to put the arid lands belonging to the city in the Morris Hill cemetery tract under cultivation, that it may be worked at this time, and through that course cleared, leveled and made ready for use when it is needed in the future.

ANACONDA, MONT.—Anaconda Copper Mining Company, 42 Broadway, New York, will operate a new power plant in connection with a smoke-treatment works to cost about $2,000,000. The structure will be about 50 x 100 feet in size, with installation consisting of 16 individual generating units, each with rating of about 75 kilowatt-ampere 220-volt single-phase machines. The electric energy will be generated at about 75,000 volts.

BOISE, IDAHO—An expenditure of $180,000 for reclaiming 4,000 acres, the first unit in the Black canyon irrigation district, was agreed upon by reclamation officials and directors of the district at a meeting held in the reclamation service offices. Under the appropriation bill recently passed and approved by the president, the $180,000 was allowed for extension work on the Boise project. It was agreed that the best results could be obtained by expending the money in watering the Black canyon lands, north of Caldwell.